**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| In re Application of | Docket No.: **TI-20567** |
| **LaVaughn F. Watts Jr.** | Art Unit: **2112** |
| Serial No.: **08/568,904** | Examiner: **Meyers, Paul R.** |
| Filed: **12/07/1995** | Conf. No.: **7575** |

For: **REAL-TIME THERMAL MANAGEMENT FOR COMPUTERS**

# SUPPLEMENTAL DECLARATION OF PRIOR INVENTION IN THE UNITED STATES TO OVERCOME CITED PATENT - 37 C.F.R § 1.131

Dear Sir:

I, LaVaughn F. Watts Jr., do hereby declare:

1. I am the inventor of the above-cited invention.

2. I submit this Supplemental Declaration to establish conception of the invention in this application in the United States on a date prior to October 11, 1994, which is the effective date of the cited U.S. patent to Dischler et al.(6,311,287)(newly cited by the Examiner in the Office Action dated May 13, 2005), and diligence in reducing the invention to practice from a date prior to October 11, 1994, which is the first effective date of cited U.S. patent to Dischler et al. (6,311,287), until the invention was actually reduced to practice on or before a date no later than December 15, 1994.

3. To establish the date of conception of the invention of this application prior to October 11, 1994, I submit true copies of the following documents (NOTE: EXHIBITS A-P submitted previously with Declaration on November 12, 2005):

EXHIBIT A - Copy of a slide presentation titled Notebook Strategic Business Unit Roadmap Key Technology Approach which I prepared on March 23, 1994 for presentation to TI upper management. It was my intent to commercialize the present invention, at least as of March 23, 1994, in a future TI laptop computer identified as project Lilyp which laptop would incorporate an Intel Pentium processor. Slide 1 discloses the Pentium processor as a P54C-100MHZ. Slide 2 identifies the project as "Pentium Notebook". Slide 3 discloses the notebook project as "Lily – 10.4 – Pentium 100MHz". Slide 8 discloses that the notebook project will have "heat management systems". Slide 9 discloses "TCP with Heat control". Slide 13 discloses "less heat – without fan;

EXHIBIT B – Copy of program DATA.ASM that I created on May 4, 1994 that was related to the present invention, that was to be implemented with Chicago (codename for Microsoft Windows 95);

EXHIBIT C – Copy of program BADATA.ASM that I created on May 4, 1994 that was related to the present invention, that was to be implemented with Chicago (codename for Microsoft Windows 95);

EXHIBIT D – Copy of program CHICAGO.INC that I created on May 4, 1994 that was related to the present invention, that was to be implemented with Chicago (codename for Microsoft Windows 95);

EXHIBIT E – Copy of e-mail message (08/30/94) from Mark Rendon to lily folks (of which Vaughn Watts was a recipient) which sets forth under "Notebook actions" & "Tasks", that Vaughn Watts was under #23 to have BatteyPro and SMI heat management ready on 09/15/94;

EXHIBIT F – Message from Jack Rawls to Dennie Shadrick (09/02/04), with copy to Vaughn Watts, identifying Project Milestones for Lilyp – Engineering models were due

09/23/94; Pre-production was due 10/14/94 and Mass production was due on 10/24/94. Page 2 of the document states "the testing (on completed Lilyp sample) yielded valuable data on thermal profiles";

EXHIBIT G – Copy of SWDEV Heat programs showing that I met the time table of 09/15/94 in EXHIBIT K above – see HEAT.BAT last modified on 09/14/1994;

EXHIBIT H - Copy of a slide presentation titled Notebook Strategic Business Unit Roadmap Key Technology Approach which I prepared on September 22, 1994, which was an update of my slide presentation dated March 23, 1994 for presentation to TI upper management (see EXHIBIT A). Most of the slides are repeats, with exceptions that slides 1 and 2 now identify the "Pentium Notebook" as being a "Lily Notebook". Slide 2 disclosed that the Lily Notebook Pentium-90, (i.e., Lilyp) predicted commercialization date has slid from late in 4Q94 to early 2Q95. Much of the remainder of the presentation is a repeat from EXHIBIT A;

EXHIBIT I – Copy of NewFile=Trange.INC which lifted and recoded on (10/14/94) which is relevant to the invention. {NOTE: changes made to the program after 10/14/94 to improve functionality are dated per the change date}.

EXHIBIT J – Copy of e-mail message from Sandeep Bhadsavle to Vaughn Watts (11/02/94) informing Vaughn that the "2nd IO channel 54h (cmd/sts just like 64h) & 50h (data just like 60h) is now functional (which was channel from which to read CPU temperature). Also note the fourth line from the bottom which states, "all comdex units will have this upgrade";

EXHIBIT K – Copy of e-mail message from Sandeep Bhadsavle to Vaughn Watts (11/03/94) encouraging Vaughn to write to 64h and read data 60h for response. And

responsive message from Vaughn Watts to Sandeep telling him that I tried to read the cpu temp (second ad channel) using the c4h command with no luck;

EXHIBIT L – Copy of document showing that "Read A/D support on 54/50 added" (Released 11/08/94). This is important since this change allowed my invention to work as designed;

EXHIBIT M – Copy of Vaughn Watts expense report for the dates 11/11-17/94 for trip to COMDEX convention in which I took an engineering model of a laptop computer that incorporated the invention in order to show it (under Non-Disclosure Agreement only) to suppliers and potential customers. The invention was reduced to practice in the engineering model as of this date;

EXHIBIT N - Copy of SWDEV Heat programs. With the exception of one ZIP file, all were completed prior to 11/09/94;

EXHIBIT O – Copy of pages 2, 17, 20, 21 and 23 of a document entitled "Lily Keyscan Board Specification – Revision 2.4 – November 16, 1994", which shows that CPU and battery temperature were being detected and evaluated;

EXHIBIT P – Copy of FILE=Thermal.Equ (dated 12/15/94) as disclosed on page 44 of the present application. Line TP1 confirms that equ 50;90 was tested. This is evidence that a version of the invention intended for deployment in a commercial product was working as of this date.

EXHIBITS A-P above were previously submitted with Applicant's Declaration of Prior Invention in the United States to Overcome Cited Patent – 37 C.F.R. § 1.131 mailed to the USPTO on November 14, 2005 – and are not being resubmitted. The below additional exhibits are being submitted herewith.

EXHIBIT Q – Confirms that the file HEAT.BAT existed as of September 14, 1994. HEAT.BAT (HEAT.BAK on disc) was used for testing and factory run-in to ensure temperature monitoring and countermeasures conformed to specification and was released for engineering model build no later than September 14, 1994.

EXHIBIT R – Copy of file AMP530F.ASM in which coding was started no later than May 4, 1994. The file is a routine to enable/disable power management.

EXHIBIT S – Copy of file AMP5306.ASM in which coding was started no later than May 4, 1994.

EXHIBIT T – Copy of file BA.ASM, which is related to file BA.DATA identified in EXHIBIT C.

EXHIBIT U – Copy of file TEMPTM5.ASM which I coded no later than August 30, 1994.

EXHIBIT V – Document created by Applicant to show how the claim limitations are supported by the cited exhibits

EXHIBIT W – Document created by Applicant to show timeline of completed events – to be used in conjunction with EXHIBIT V.

4. <u>DISCUSSION</u> – I was preparing code for the present invention on or before May 4, 1994. EXHIBIT B shows that the files: idletick, timertick; keyboardtick; power_level; dos_power_level; Maxpower_level; busy_int2f; busy_int28; busy_int21; wstack; ac_parms; sound_parms; ESeries; and sleep_tick_count were coded as of May 4, 1994. I finished the code for the prototype model no later than September 2, 1994. The prototype model, which used ram-based memory, was tested and received preliminary UL

(Underwriters Laboratory), CUL, and TUV approval no later than September 2, 1994 (see third paragraph of EXHIBIT F-2 under "New Products"). Line 1 of EXHIBIT F-3 indirectly confirms this by stating that "remaining" LilyP prototypes were to be completed, which confirms that at least one prototype was finished by September 2, 1994.

EXHIBITS G, N and Q confirm that the file HEAT.BAT existed no later than September 14, 1994 and this file was implemented in the prototype model running as of September 2, 1994. HEAT.BAT (HEAT.BAK on disc) was used for testing and factory run-in to ensure temperature monitoring and countermeasures conformed to specification and was released for engineering model build no later than September 14, 1994. EXHIBIT R is a copy of file AMP530F.ASM in which coding was started no later than May 4, 1994. The file is a routine to enable/disable power management. EXHIBIT S is a copy of file AMP5306.ASM in which coding was started no later than May 4, 1994. The file is a routine to determine if the CPU is busy – if yes, it reduces IDLE. Files AMP530F.ASM and AMP5306.ASM are associated with program CHICAGO.INC identified in EXHIBIT D.

EXHIBIT T-(1-5) discloses file BA.ASM, which is related to file BA.DATA identified in EXHIBIT C. File BA.ASM is a routine to determine if the CPU requires thermal slice servicing. The file was completed sometime between May 4, 1994 and August 30, 1994. BA.ASM-1 shows the file contains a FORCED COOLDOWN LOOP at Interrupt level. BA.ASM-2 shows the file called on every system timer interrupt and was ready to look at a thermal event. BA.ASM-3 shows that TLEVELn interfaces with TEMPTM5.ASM for RAM Based or interfaces with CMOS storage for same A/D Temperature value if FLASHROM Based. It also confirms the file enabled looking at a thermal event slice period based on temperature. BA.ASM-4 confirms AC and Battery Operation House cleaning and NON-Thermal Management Event. BA.ASM-5 confirms Thermal Management Event – slice needed during interrupt? and forcing cool down loop.

EXHIBIT F-1 confirms that non-production engineering models of the apparatus (LilyP) were to be completed no later than September 23, 1994, with pre-production engineering models to be completed no later than October 14, 1994. The non-production engineering model of the apparatus (LilyP) was completed no later than September 23, 1994. EXHIBIT U-(1-3) discloses relevant portions of file TEMPTM5.ASM which I coded no later than August 30, 1994. To the extent I made any changes to file TEMPTM5.ASM as it evolved into file Trange.INC, the changes did not affect the patentability of the claims. As with the prototype, the pre-production model used ram-based memory. However, the pre-production model slated for completion on October 14, 1994 was specified to have ROM-based memory. Accordingly, I finished re-coding file TEMPTM5.ASM as file Trange.INC (EXHIBIT-I) on a date no later than October 14, 1994 so as to run on a ROM-based preproduction model.

Further, since agency testing was started before 9/15/94, all code that changed clocks had to be finished before FCC agency testing was started. That did not mean that I could not change the time that I spent inside one clock or another (e.g. change the temperature settings ranges, or change the period within the clock cycle to better save more power or more heat). However I could not introduce any NEW frequencies and had to be able to run at all frequencies. As for UL I needed the thermal management to pass the UL or it would get too hot, so in combo of agency testing, the raw basic code was there.

The major differences after 9/15/94 was changing the code over to use the ROM rather than RAM, then use FLASH rather than ROM. After the alternate channels 50 and 54 hex to the keyboard controller to read the A/D to get the temperature was not written until 10/14. Prior to 10/14 I used channels 60 and 64 hex to read the A/D from the keyboard controller to get the temperature. Both channels were to give the exact same information. However for IBM compatibility, I needed to change the temperature read channel from 60/64 to 50/54 prior to production to keep software from locking up that

might access the keyboard via the 60/64 at the same time that we wanted to read the temperature. Also, by changing the channels to 50/54 I could read the temperature anytime without worrying about who was also accessing the keyboard controller and when. Evidence documenting the problem with the 50/54 channel that I found after I changed to code over to use it prior to engineering model used at COMDEX is found in EXHIBITS J, K, L. The original patent application was filed with my best implementation of all the code at the time that included things done on or before 9/15/94 up to filing the patent. I was very careful in the code to note when I made changes.

The TRANGE code submitted was what was used in production. Notice that it read as "recoded from TEMPTM5". There is no change notice inside the code reflecting any other changes. The only thing different about this code and the TEMPTM5 code was the use age of 50/54 in the TRANGE vs. 60/64 in the TEMPTM5 code. I had to keep two sets of code running at the time. The agency code and test code used the TEMPTM5 with 60/64 channel access and the TRANGE used the 50/54 and it was in debug stage until the 50/54 code worked. Functionality was split between the Flash Driver Interface and the FlashROM code after October 14, 1994. The main logic of TEMPTM5.ASM was later used inside the RAM portion of the Flash Driver Interface that called TRANGE located in FLASH ROM. From August 30, 1994 until October 14, 1994, RAM resident functions within TEMPTM5.ASM were used for testing, prototype, and samples.

My debugging was successful and this problem no longer existed in the engineering model of the laptop computer (Lily) that I took to the COMDEX convention during 11/11-17/94. So, the units for COMDEX used the new TRANGE code rather than the test agency code. However, for patent purposes, the codes were functionally the same with regard to the invention for which patenting is sought.

EXHIBIT E task #6 shows that the complete board layout for a prototype computer was to be finished by September 2, 1994. Accordingly, I confirm that – Copy of e-mail

message (08/30/94) from Mark Rendon to lily folks (of which Vaughn Watts was a recipient) which sets forth under "Notebook actions" & "Tasks", that Vaughn Watts was under #23 to have BatteyPro and SMI heat management ready on 09/15/94, which were to be implemented on the prototype computer finished by September 2, 1994.

In the Office Action dated February 2, 2006, Examiner determined that Applicant's Declaration submitted on November 14, 2005 "did not indicate which claim limitations are supported by the cited Exhibits". EXHIBIT V is a document I have created to indicate which claim limitations are supported by the cited Exhibits. EXHIBIT I is cited extensively in EXHIBIT V to provide enabling support for the claims. EXHIBIT I is a copy of NewFile=Trange.INC which lifted and recoded on (10/14/94) and was the code used on the engineering model I took with me to COMDEX. It is important to note, however, that file Trange.INC is a recoding of a previous file TEMPTM5.ASM., which was implemented on a prototype computer on or before September 15, 1994, and for patentability purposes, provided the same support.

EXHIBIT V – (1-6) show how Claim 17 is supported by the cited Exhibits. EXHIBIT V – (7-12) show how Claim 18 is supported by the cited Exhibits. EXHIBIT V – (13) shows how Claims 19 and 20 are supported by the cited Exhibits. EXHIBIT V – (14-22) show how Claim 21 is supported by the cited Exhibits. EXHIBIT V – (23-24) show how Claim 23 is supported by the cited Exhibits. EXHIBIT V – (25-36) show how Claim 74 is supported by the cited Exhibits. EXHIBIT V – (37-50) show how Claim 75 is supported by the cited Exhibits. EXHIBIT V – (51-64) show how Claim 76 is supported by the cited Exhibits. EXHIBIT V – (65) shows how Claims 77-79 are supported by the cited Exhibits. EXHIBIT V – (66) shows how Claims 80-82 are supported by the cited Exhibits. EXHIBIT V – (67) shows how Claims 80-82 are supported by the cited Exhibits. EXHIBIT V – (68) shows how Claims 83-85 are supported by the cited Exhibits. EXHIBIT V – (69-71) show how Claims 83-85 are supported by the cited Exhibits. EXHIBIT V – (72-74) show how Claims 86-88 are supported by the cited Exhibits. EXHIBIT V – (75-77) show

how Claims 88-91 are supported by the cited Exhibits. EXHIBIT V – (78) shows how Claims 92-94 are supported by the cited Exhibits. EXHIBIT V – (79-80) show how Claims 95-97 are supported by the cited Exhibits. EXHIBIT V – (81-82) show how Claims 83-85 are supported by the cited Exhibits. EXHIBIT V – (83) shows how Claims 101-103 are supported by the cited Exhibits. EXHIBIT V – (84-85) show how Claims 104-106 are supported by the cited Exhibits. EXHIBIT V – (86) shows how Claims 107-109 are supported by the cited Exhibits. EXHIBIT V – (87) shows how Claim 110 is supported by the cited Exhibits. EXHIBIT V – (88) shows how Claim 111 is supported by the cited Exhibits. EXHIBIT V – (89) shows how Claim 112 is supported by the cited Exhibits. EXHIBIT V – (90) shows how Claim 113 is supported by the cited Exhibits. EXHIBIT V – (91) shows how Claim 116 is supported by the cited Exhibits. EXHIBIT V – (92) shows how Claims 117-118 are supported by the cited Exhibits. EXHIBIT V – (93) shows how Claim 119 is supported by the cited Exhibits. EXHIBIT V – (94-102) shows how Claim 122 is supported by the cited Exhibits. EXHIBIT V – (103-111) shows how Claim 123 is supported by the cited Exhibits. EXHIBIT V – (112-121) shows how Claim 124 is supported by the cited Exhibits. EXHIBIT V – (122-130) shows how Claim 125 is supported by the cited Exhibits. EXHIBIT V – (131-139) shows how Claim 126 is supported by the cited Exhibits.

EXHIBIT W is a document created by Applicant to show timeline of completed events – to be used in conjunction with EXHIBIT V.

5. I hereby declare that I conceived the invention (see Exhibits A & H) on a date prior to October 11, 1994, which is the first effective date of cited U.S. patent to Dischler et al. (6,311,287). Thereafter I worked diligently on reducing the invention to practice in a timely and orderly manner (see Exhibits B-G & Q-U) from at least one day prior to October 11, 1994, which is the first effective date of cited U.S. patent to Dischler et al. (6,311,287) until the invention (using HEAT.BAT - BatteyPro and SMI heat

management ready on 09/15/94, implemented on the prototype computer finished by September 2, 1994) was actually reduced to practice, which Applicant now believes to be no later than September 15, 1994 - which is prior to October 11, 1994.

Even if, arguendo, a determination is subsequently made that I have not submitted sufficient proof to show actual reduction to practice no later than September 15, 1994, I respectfully submit that the above identified Exhibits prove conception of my invention and additional Exhibits I-O show that I worked diligently on reducing the invention to practice in a timely and orderly manner from at least one day prior to October 11, 1994, which is the first effective date of cited U.S. patent to Dischler et al. (6,311,287) until the invention was actually reduced to practice. While I now believe that my invention was actually reduced to practice no later than September 15, 1994, in the event the evidence I submitted is insufficient to show actual reduction to practice by September 15, 1994, I believe that the submitted evidence proves diligence in reducing the invention to practice no later than November 8, 1994 (fall back actual reduction to practice date) in the engineering notebook model I took to COMDEX on November 11, 1994. Accordingly, I now respectfully submit that my actual reduction to practice date was well before December 15, 1994 (see Exhibit P).

6. I submitted my original Declaration prior to final rejection and was submitted at Applicant's first opportunity to respond since the Dischler et al. reference was first cited in the Office action dated May 13, 2005. Examiner later determined in an Office Action dated February 2, 2006, that the Declaration was insufficient to establish diligence from a date prior to the date of reduction to practice of the Dischler et al reference to either a constructive reduction to practice or an actual reduction to practice. More particularly, Examiner determined that the Declaration does not indicate what claim limitations are supported by the cited Exhibits. While I disagree with Examiner's insufficiency determination, I now submit this Supplemental Declaration to clarify the record and clearly overcome Examiner's insufficiency determination. This Supplemental Declaration is my

first opportunity to respond to Examiner's insufficiency arguments as set forth in the Office Action dated February 2, 2006.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

/La Vaughn F. Watts/

La Vaughn F. Watts Jr.

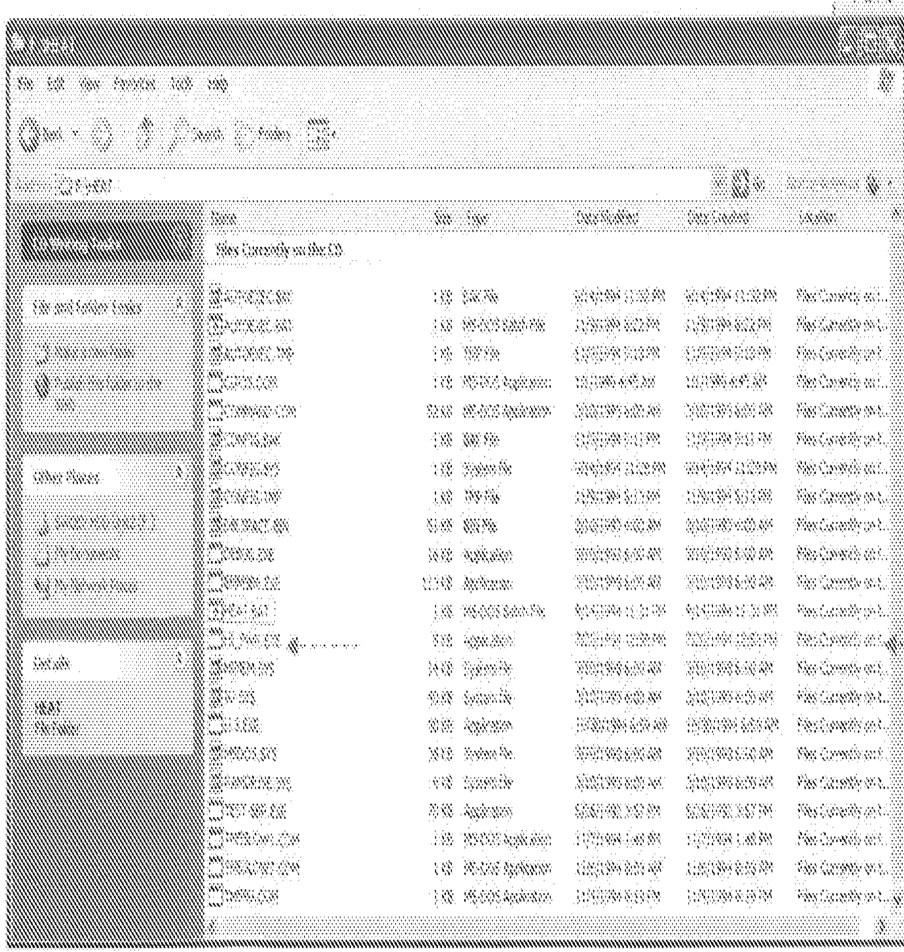
Signed by: Vaughn' Watts
Date: Timestamped
Location:
Reason: Final

Date: November 14, 2006

7GswT2aWCT/jVqoxvUTTPfTOOpA=

# New Exhibit HEAT


HEAT.BAT (HEAT.BAK on disc) used for testing and factory run-in to ensure temperature monitoring and countermeasures conformed to specification – release to factory 9/14/1994 for Engineering Model Build



Heat.bat runs program Hi_pwr.exe To generate Heat inside Engineering Model Hi_pwr.exe created 7/20/1994

Exhibit HEAT-1

EXHIBIT Q-I

# New Exhibit APM530F.ASM

APM530F.ASM - Notepad

File Edit Format View Help

```
;
;File=APM530F.ASM
;Watts
;2/6/94
;Coded for Chicago 5/4/94
;------------------------------------------------------------------
; Enable/Disable Power Management Functionality
; Enter: ah = 53h
;        al = 0Fh
;        bx = FFFFh Enable/Disable all power management
;        cx = 0 to disable power management
;             1 to enable power management
; Exit:  if successful
;        CY = clear
;        if unsuccessful
;        CY = set
;        ah = 01h power management functionality disabled
;             09h unrecognized device ID
;             0Ah parameter in CX out of range
;
APMEngagePM     PROC    NEAR

        push    ds                      ; Save Data Segment
        push    cx
        pop     ds                      ; Setup common real vs p32 mode
        call    CommonAPMEngagePM
        pop     ds
        pop     di
        ret

APMEngagedSystem        db      INTERFACE_DISENGAGED
APMEngagePM ENDP
CommonAPMEngagePM       PROC NEAR

        cmp     Interface_connect,INTERFACE_OFF
        je      APM530FNotConnected
        cmp     bx,0FFFFh
        jne     APM530FBadDeviceID
        cmp     cx,1

        je      APM530FEngagePlease
        cmp     cx,0
        je      APM530FDisengagePlease

        jmp     short APM530FBadCxRegister

APM530FDisengagePlease:
;
;       Wants to Disengage system
;
        cmp     APMEngagedSystem,INTERFACE_ENGAGED
        jne     APM530FPowerDisabled
        mov     APMEngagedSystem,INTERFACE_DISENGAGED
        clc
        ret
APM530FEngagePlease:
        mov     APMEngagedSystem,INTERFACE_ENGAGED
        clc
        ret
APM530FBadDeviceID:
        mov     ah,APM_ERROR_09
        jmp     short APM530FError
APM530FError:
        stc
        ret
APM530FNotConnected:
        mov     ah,APM_ERROR_03
        jmp     short APM530FError
APM530FPowerDisabled:
        mov     ah,APM_ERROR_01
        jmp     short APM530FError
APM530FBadCxRegister:
        mov     ah,APM_ERROR_0A
        jmp     short APM530FError
CommonAPMEngagePM       ENDP
```

Routine to enable/disable Power Management – started Coded 5/4/94

APM530F.ASM - Notepad

File Edit Format View Help

```
;
;File=APM530F.ASM
;Watts
;2/6/94
;Coded for Chicago 5/4/94
;------------------------------------------------------------------
; Enable/Disable Power Management Functionality
; Enter: ah = 53h
;        al = 0Fh
;        bx = FFFFh Enable/Disable all power management
;        cx = 0 to disable power management
;             1 to enable power management
; Exit:  if successful
;        CY = clear
;        if unsuccessful
;        CY = set
;        ah = 01h power management functionality disabled
;             09h unrecognized device ID
;             0Ah parameter in CX out of range
;
APMEngagePM     PROC    NEAR
```

Exhibit APM530F.ASM-1

EXHIBIT R

# New Exhibit APM5306.ASM

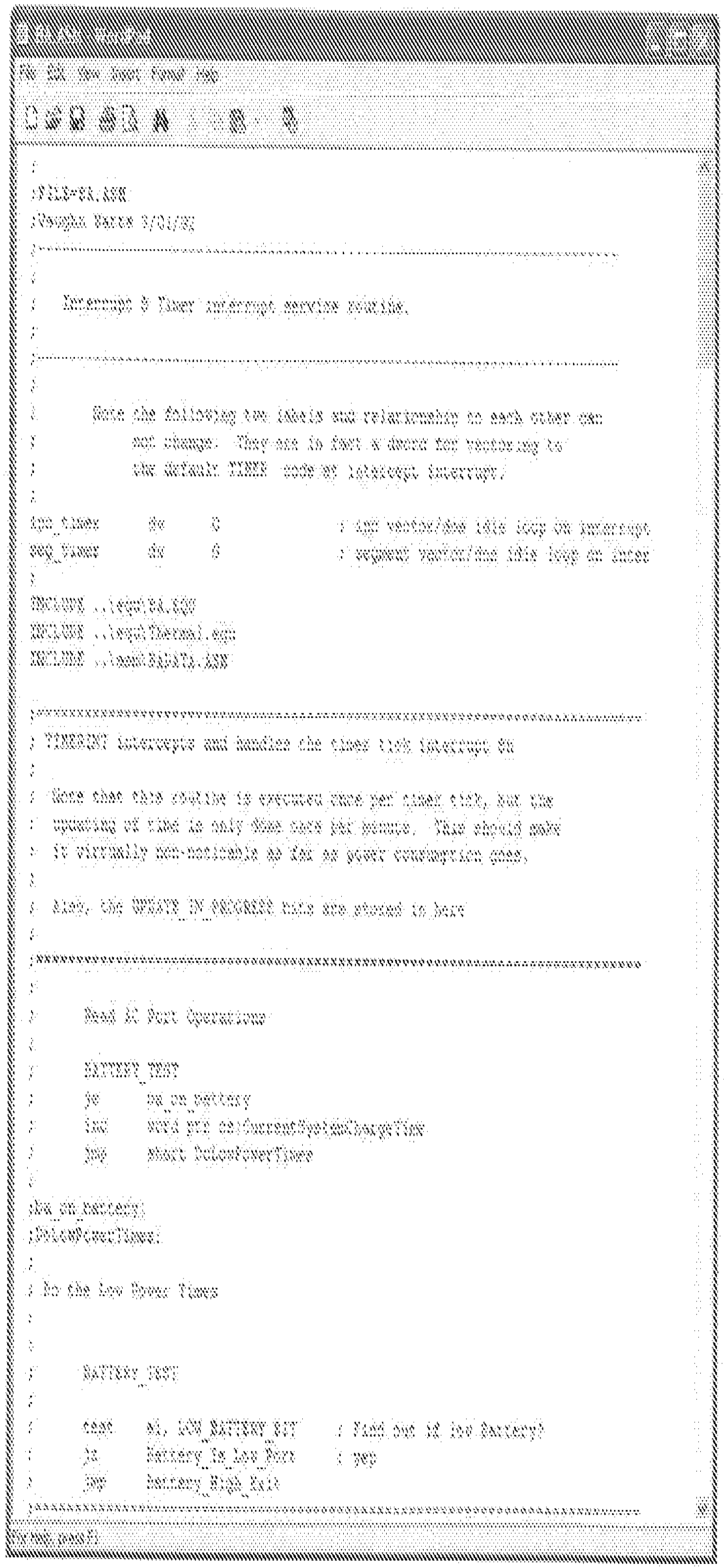
```
APM5306.ASM - Notepad
File Edit Format View Help
;
;FILE=APM5306.ASM
;Vaughn Watts 2/22/92
;Coded for Chicago 5/4/94 watts
;---------------CPU BUSY POLL LOOP----------------------------------------
;
; CPU Busy
; Enter: AH = 53h
;        AL = 06h
; Exit:  CY = 0
;
APMCPUBusy      PROC    NEAR

        push    ds                      ; Save Data Segment
        push    cs
        pop     ds                      ; Setup common real vs p32 mode
        call    CommonAPMCPUBusy
        pop     ds
        pop     di
        ret
APMCPUBusy      ENDP

CommonAPMCPUBusy        PROC    NEAR


        cmp     interface_connect,INTERFACE_OFF
        je      APM5306NotConnected

        cmp     APMEngagedSystem,INTERFACE_ENGAGED
        jne     APM5306NotEngaged
;
;       Give the CPU some Bandwidth
;
        mov     idletick,0                      ; Slow down IDLE
        mov     timertick,0                     ; Slow down INT 21
        clc                                      ; No error
        ret
APM5306NotEngaged:
        mov     ah,APM_ERROR_0B
        stc
        ret
APM5306NotConnected:
        mov     ah,APM_ERROR_03
        stc
        ret

CommonAPMCPUBusy        ENDP
```

Routine to determine if CPU is busy – reduces IDLE started Coded 5/4/94

Exhibit APM5306.ASM-1

EXHIBIT S

New Exhibit BA.ASM



BA.ASM - WordPad

File Edit View Insert Format Help

```
;
;FILE=BA.ASM
;Vaughn Watts [illegible]
;----------------------------------------------------------------------
;
;   Interrupt 8 Timer interrupt service routine.
;
;----------------------------------------------------------------------
;
;      Note the following two labels and relationship to each other can
;          not change.  They are in fact a dword for vectoring to
;          the default TIMER code at intercept interrupt.
;
ipo_timer     dw     0          ; ipo vector/the idle loop on interrupt
seg_timer     dw     0          ; segment vector/the idle loop on inter
;
INCLUDE ..\equ\BA.EQU
INCLUDE ..\equ\thermal.equ
INCLUDE ..\mem\[illegible].ASM

;**********************************************************************
; TIMERINT intercepts and handles the timer tick interrupt 08
;
; Note that this routine is executed once per timer tick, but the
; updating of time is only done once per minute.  This should make
; it virtually non-noticeable as far as power consumption goes.
;
; Also, the UPDATE_IN_PROGRESS bits are stored in here
;
;**********************************************************************
;
;     Read AC Port Operations
;
;     BATTERY_TEST
;     jz     Do_on_battery
;     inc    word ptr cs:CurrentSystemChargeTime
;     jmp    short DoLowPowerTimer
;
;Do_on_battery:
;DoLowPowerTimer:
;
; Do the Low Power Timer
;
;
;     BATTERY_TEST
;
;     test   al, LOW_BATTERY_BIT     ; find out if low battery?
;     jz     Battery_Is_Low_Port     ; yep
;     jmp    Battery_High_Exit
;**********************************************************************
```

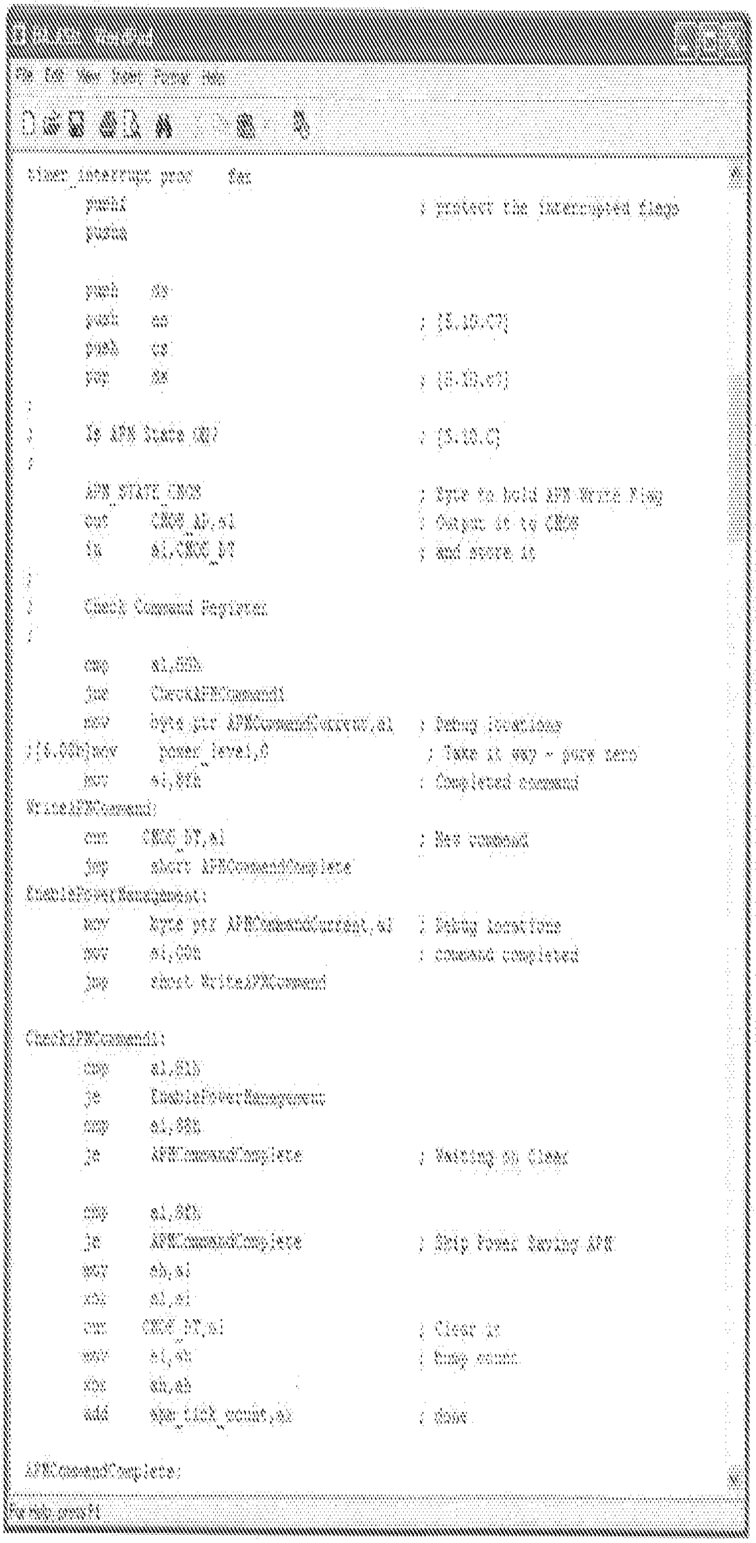
For Help, press F1

Routine to determine if CPU is needing thermal slice servicing. Written sometime on or after 5/4/94 and before 8/30/1994. – contains FORCED COOLDOWN LOOP at Interrupt level.

Exhibit BA.ASM-1

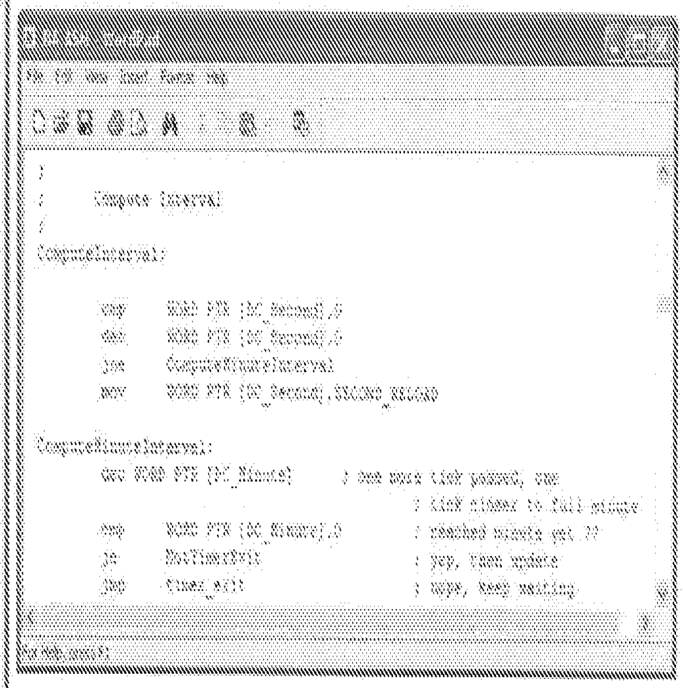
EXHIBIT T-1

# New Exhibit BA.ASM



```
timer_interrupt proc    far
        pushf                           ; protect the interrupted flags
        pusha

        push    ds
        push    es                      ; [5.10.C?]
        push    cs
        pop     ds                      ; [5.10.c?]
;
;       Is APM State ON?                ; [5.10.C]
;
        APM_STATE_CMOS                  ; Byte to hold APM Write Flag
        out     CMOS_AD,al              ; Output it to CMOS
        in      al,CMOS_DT              ; and store it
;
;       Check Command Register
;
        cmp     al,[illegible]
        jne     CheckAPMCommand1
        mov     byte ptr APMCommandCurrent,al   ; Debug locations
;[6.00b]mov     power_level,0           ; Take it way - pure zero
        mov     al,[illegible]          ; Completed command
WriteAPMCommand:
        out     CMOS_DT,al              ; New command
        jmp     short APMCommandComplete
EnablePowerManagement:
        mov     byte ptr APMCommandCurrent,al   ; Debug locations
        mov     al,00h                  ; command completed
        jmp     short WriteAPMCommand

CheckAPMCommand1:
        cmp     al,[illegible]
        je      EnablePowerManagement
        cmp     al,[illegible]
        je      APMCommandComplete      ; Waiting on Clear

        cmp     al,[illegible]
        je      APMCommandComplete      ; Skip Power Saving APM
        mov     ah,al
        xor     al,al
        out     CMOS_DT,al              ; Clear it
        mov     al,ah                   ; Bump count
        xor     ah,ah
        add     apm_tick_count,ax       ; done

APMCommandComplete:
```

Called on every system timer interrupt



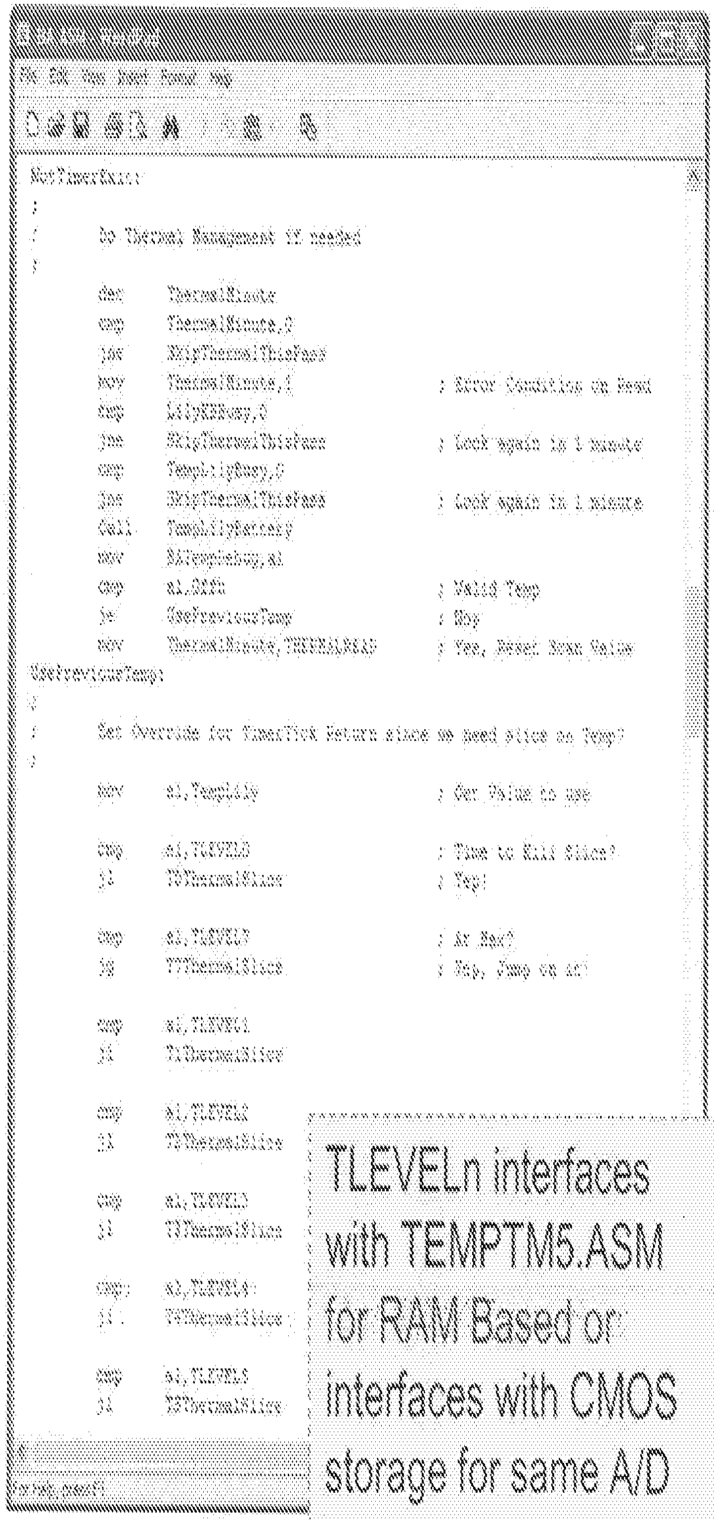
```
;
;       Compute Interval
;
ComputeInterval:

        cmp     WORD PTR [DC_Second],0
        dec     WORD PTR [DC_Second],0
        jne     ComputeMinuteInterval
        mov     WORD PTR [DC_Second],SECOND_RELOAD

ComputeMinuteInterval:
        dec WORD PTR [DC_Minute]        ; one more tick passed, one
                                        ; tick closer to full minute
        cmp     WORD PTR [DC_Minute],0  ; reached minute yet ??
        je      DocTimerExit            ; yep, then update
        jmp     timer_exit              ; nope, keep waiting
```

Now ready to look at thermal event

Exhibit BA.ASM-2

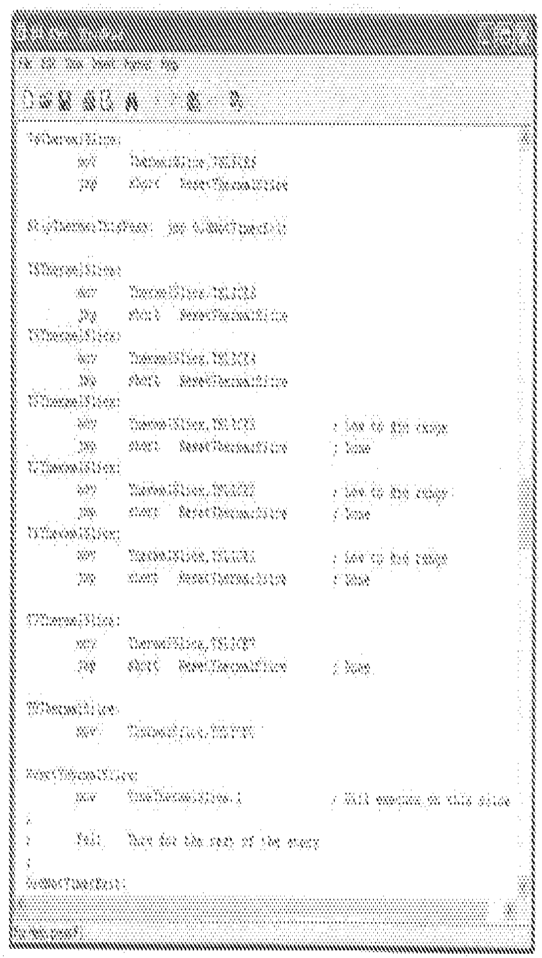
EXHIBIT T-2

## New Exhibit BA.ASM



Thermal Management Event

Now ready to look at thermal event slice period based on temperature



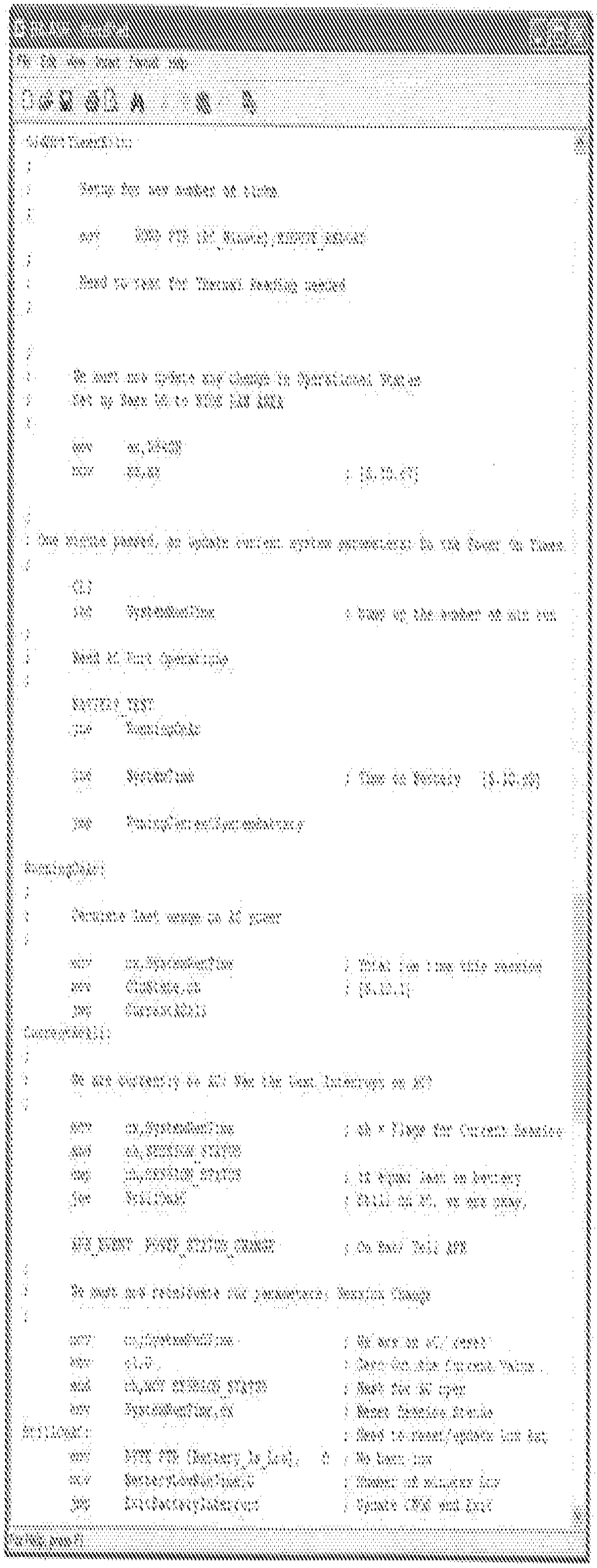
TLEVELn interfaces with TEMPTM5.ASM for RAM Based or interfaces with CMOS storage for same A/D Temperature value if FLASHROM Based

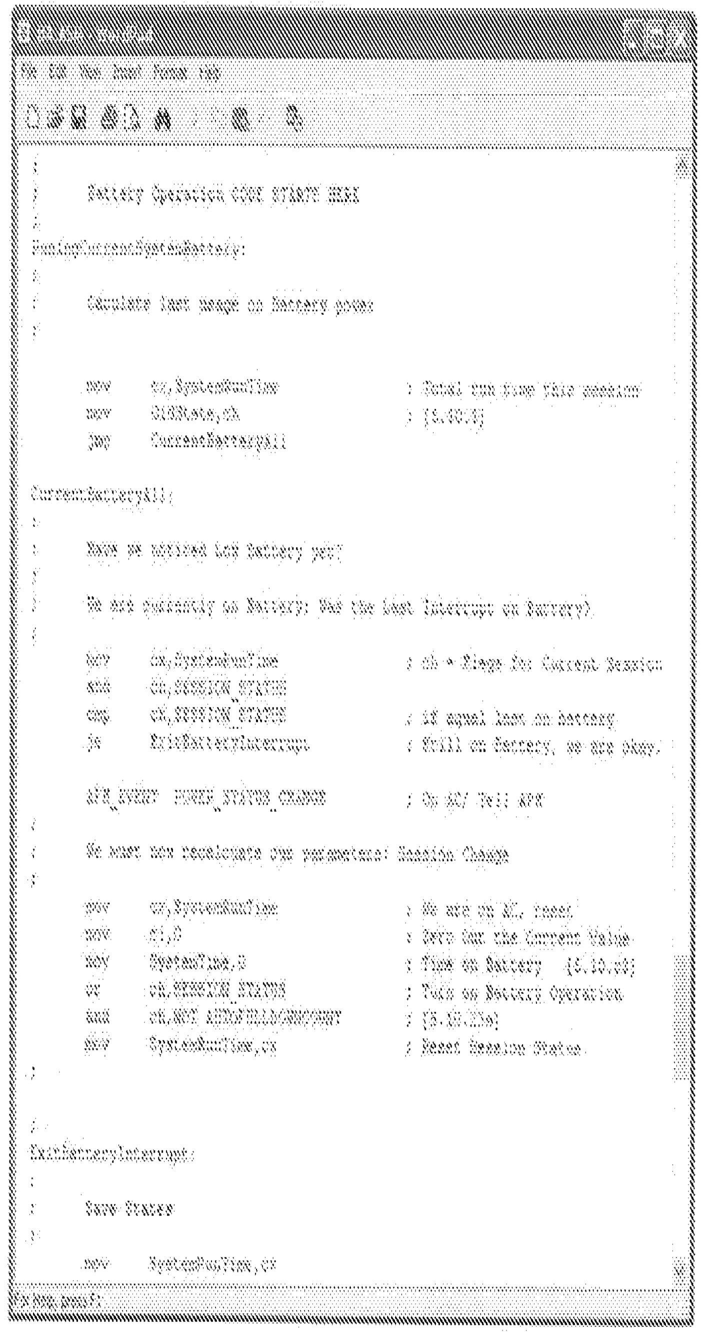
Exhibit BA.ASM-3

EXHIBIT T-3

# New Exhibit BA.ASM

NON-Thermal Management Event





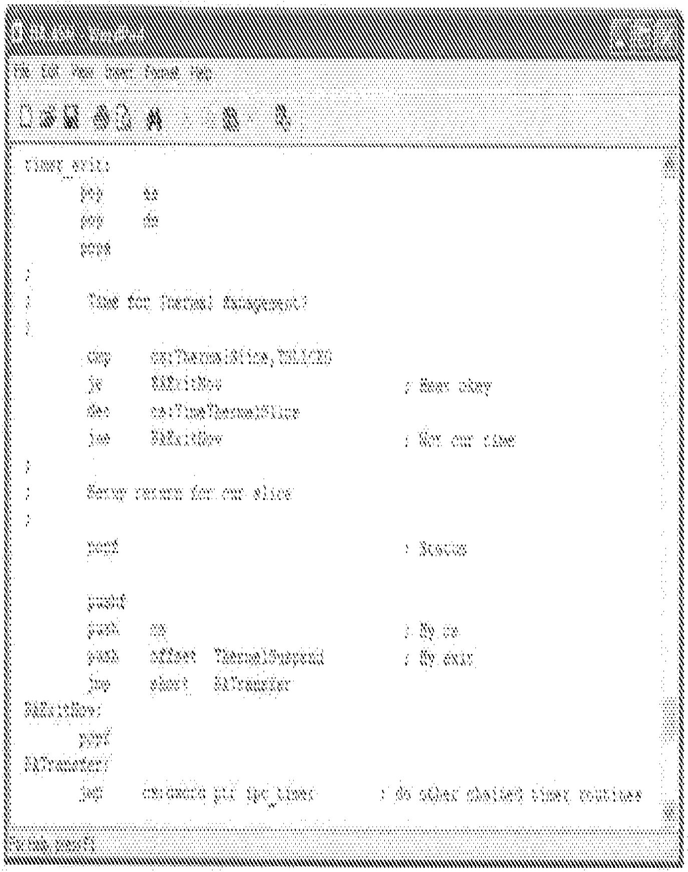
AC and Battery Operation House cleaning

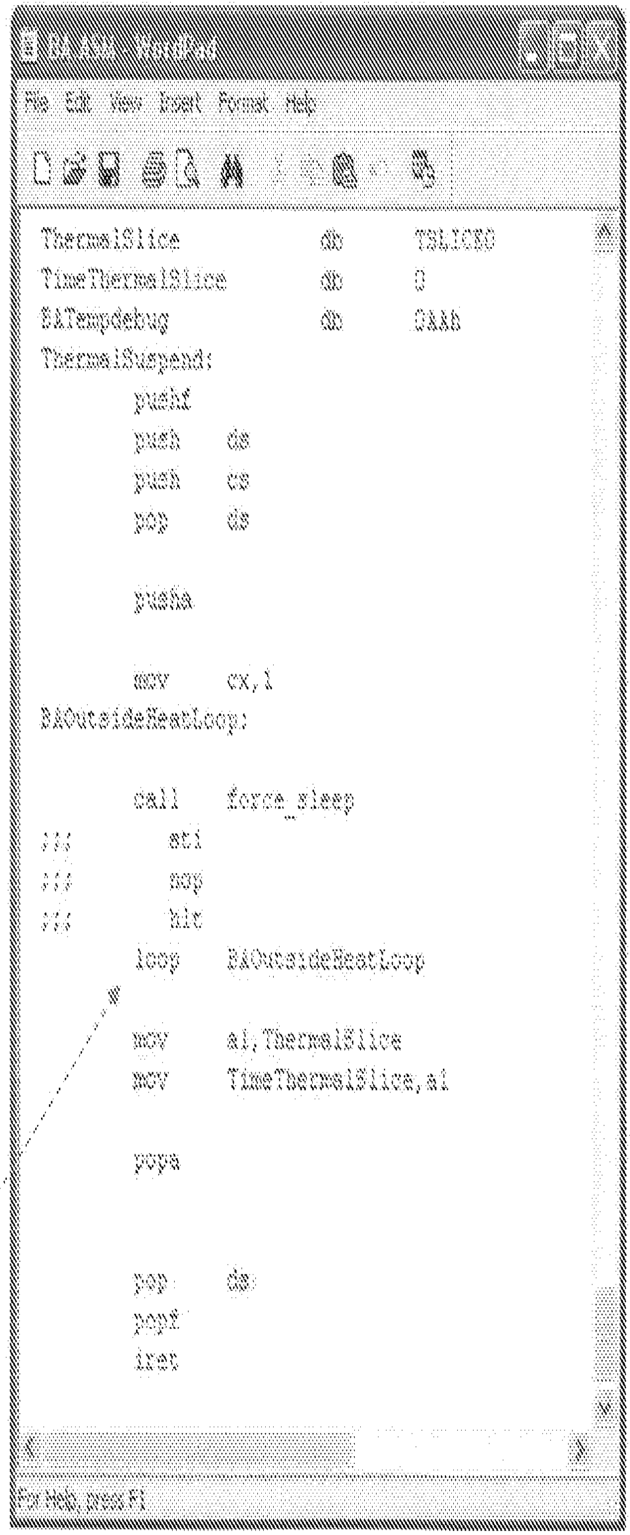
Exhibit BA.ASM-4

EXHIBIT T-4

New Exhibit BA.ASM

Thermal Management Event – slice needed during interrupt?


```
timer_exit:
        pop     es
        pop     ds
        popa
;
;       Time for Thermal Management?
;
        cmp     cs:ThermalSlice,TSLICE0
        je      BAExitNow                       ; Heat okay
        dec     cs:TimeThermalSlice
        jne     BAExitNow                       ; Not our time
;
;       Setup return for our slice
;
        popf                                    ; Status

        pushf
        push    cs                              ; My cs
        push    offset  ThermalSuspend          ; My exit
        jmp     short   BATransfer
BAExitNow:
        popf
BATransfer:
        jmp     cs:dword ptr ipc_timer        ; do other chained timer routines
```


BA.ASM - WordPad

File Edit View Insert Format Help

```
ThermalSlice            db      TSLICE0
TimeThermalSlice        db      0
BATempdebug             db      0AAh
ThermalSuspend:
        pushf
        push    ds
        push    cs
        pop     ds

        pusha

        mov     cx,1
BAOutsideHeatLoop:

        call    force_sleep
;;;     sti
;;;     nop
;;;     hlt
        loop    BAOutsideHeatLoop

        mov     al,ThermalSlice
        mov     TimeThermalSlice,al

        popa


        pop     ds
        popf
        iret
```
For Help, press F1

forcing cool down loop – really a "one shot" since CX=1

EXHIBIT T-5

Exhibit BA.ASM-5

# New Exhibit TEMPTM5.ASM

```
;
;File=TEMPTM5.ASM
;Coded: Watts (8/30/94)
;Added new BPRO CMOS Locations for holding values: Watts (10/14/94)
;Changed Keyboard channel to 50/54 for the C4 command so no lockups (10/14/94)
;Secondary keyboard channel now works for lillytemp.. be sure to get new
;keyscan code from Sandeep and update your H8 ..11/19/94yw
;Reviewed for flashbios issues 2/11/95
;
;    Read the Battery on LILLYP from Keyboard Controller
;
;    Calling Arguments
;
;    Call    TempLilyBattery
;    cmp     al,0ffh
;    je      OnACLoadFF          ; Don't know value since it's on Charge

;
TempLilyBattery  Proc    Near
    mov     al,0ffh
    ret

    mov     TempLilyBusy,1


    push    si              ; Save registers not needed
    push    cx

    CLI                     ; Disable Interrupts
```

Also Reads A/D Converter for Lillyp (TM5000) Temperature Sensor when it reads battery status

# New Exhibit TEMPTM5.ASM

```
PBBATTERY_RETRY equ    250
     mov    cx,PBBATTERY_RETRY      ; retries
tset_quiet_0:
     in     al,54h
     test   al,1               ;check the output buffer status
     jz     tset_quiet_1            ;output buffer not full?
     jmp    short tSet_status_unknown:[7.10T3]

tset_quiet_1:                       ;yes, output buffer not full.
     test   al,2               ;check input buffer status
     jnz    short tSet_status_unknown:[7.10T4]
;
;    Should keyboard or Aux or both be disabled at this point?


 ;    To disable keyboard, port 64=0adh  to disable aux, port 64= 0a7h
 ;    To enable keyboard,  port 64=0aeh  to enable  aux, port 64= 0a8h
 ;


      mov    al,0c4h              ;no, then output the read A/D.
      out    54h,al              ;was 64h 10/14/94vw
 tset_quiet_2:
```

Modified on 10/14/94 to use new 50/54h A/D channel rather than previous 60/64h channel

EXHIBIT U-2

Exhibit TEMPTM5.ASM-2

# New Exhibit TEMPTM5.ASM

```
tSet_quiet_2_Okay:              ;[7.10.3]
    jmp   $+2
    in    al,54h          ;read status port
    jmp   $+2
    jmp   $+2
    test  al,2 ;;3            ;check status of input port and output port,
    jnz   tset_quiet_2        ;full ? , then go back.
    mov   al,06           ;empty, then output the read A/D 6
    out   50h,al          ;was 60h 10/14/94vw
tset_quiet_3:
    loop  tSet_quiet_3_Okay      ;[7.03]
    jmp   short tSet_status_unknown;[7.03]
tSet_quiet_3_Okay:
    jmp   $+2
    in    al,54h          ;read the status  10/14/94vw
    test  al,1            ;check the output buffer status
    jz    tset_quiet_3        ;check if output buffer not full, then go back

    in    al,50h          ;full, then, get A/D value  10/14vw
    mov   TempLily,al
;
;
;   Constant  00 - 255 value : 0 ~ 5000mV
;   Constant  10mV/1 degree C
;   k = (5000/255)  = 19.607843
;   n degree C = k/10
;   n degree C = k/10 * Value
;
;
    . . .
```

Modified on 10/14/94 to use new 50/54h A/D channel rather than previous 60/64h channel

Reads Temperature Data from Sensor

Reads Temperature Data from Sensor

Read of Temperature Data from Sensor must be converted to n degree C via equation, Trange's job to convert and range

EXHIBIT U-3

Exhibit TEMPTM5.ASM-3

# Claim 17

17. (Previously presented) An apparatus, comprising:
means for sampling a temperature associated with the operation of a processing unit within said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit; (B) and

means for using said prediction for automatic control of temperature within said apparatus. (C)

```
    cmp     al,08h                      ;Time to read data from KB?
    je      DoKBThermalRead
    mov     al,?
    dec     al
    and     ah,NOT 38h                  ;Keep theold stuff
    shl     al,3
    or      ah,al                       ;New value
    jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it alone.
;
    call    UpdateTemperature           ;Do it
    mov     al,3ah
    call    CmosRead                    ;Read Temperature byte
    mov     ah,al                       ;Direction/Time/Level
    and     ah,38h                      ;Just the time and level
please
    mov     bh,al                       ;Get the direction
    and     al,7                        ;Level computed for Temp
range
    and     bh,11000000b                ;Direction

    cmp     ah,0                        ;Good read?
    jne     LeaveDownCountT             ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b                ;OSC?
    jne     NotTR_OSC                   ;Nop!
```

EXHIBIT I-2

A sample

Temperatures and control signals are returned in CMOS storage area that is read by CMOSRead program

(A) ...sampling a temperature associated with the operation of a processing unit within said apparatus

Implementation functional
For protype and patent purposes
By 9/15/1994

EXHIBIT V

# Claim 17

17. (Previously presented) An apparatus, comprising:
means for sampling a temperature associated with the operation of a processing unit within said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit; (B) and

means for using said prediction for automatic control of temperature within said apparatus. (C)

```
    cmp     al,08h                  ;Time to read data from X3?
    je      DoX8ThermalRead
    mov     al,?
    dec     al
    and     ah,NOT 38h              ;Keep theold stuff
    shl     al,3
    or      ah,al                   ;New value
    jmp     WriteDownCount7

DoX8ThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       We had one, else we need to leave it along.
;
    call    UpdateTemperature       ;Do it
    mov     al,3ah
    call    CmosRead                ;Read Temperature byte
    mov     al,ah                   ;Direction/Time/Level
    and     ah,38h                  ;Just the time and level
please
    mov     bh,al                   ;Get the direction
    and     al,7                    ;Level computed for Temp
range
    and     bh,11000000b            ;Direction

    cmp     ah,0                    ;Good read?
    jne     LeaveDownCount7         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b            ;OSC?
    jne     NotTR_OSC               ;Nop!
```

EXHIBIT I-2

A sample

Temperatures and control signals are returned in CMOS storage area that is read by CMOSRead program

(A) ...sampling a temperature associated with the operation of a processing unit within said apparatus

EXHIBIT V-I

Implementation functional
For protype and patent purposes
By 9/15/1994

17. (Previously presented) An apparatus, comprising:
means for sampling a temperature associated with the operation of a processing unit within said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit; (B) and

means for using said prediction for automatic control of temperature within said apparatus. (C)

```
        cmp     al,08h                  ;Time to read data from X8?
        je      DoX8ThermalRead
        shr     al,3
        dec     al
        and     ah,NOT 38h              ;Keep theold stuff
        shl     al,3
        or      ah,al                   ;New value
        jmp     WriteDownCountT

DoX8ThermalRead:
;
;       Try for a Thermal Management bit: return time count = 0
Then
;       we had one, else we need to leave it along.
;
        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     ah,al                   ;Direction/Time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction
        cmp     ah,0                    ;Good read?
        jne     LeaveDownCountT         ;Nop, leave it along
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTR_OSC               ;Nop!
```

Looking at direction, prediction Dependent on SetTrange and storing value in CMOS for this read.

(B) ... responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit

Implementation functional
For protype and patent purposes
By 9.15.1994

EXHIBIT I-2

EXHIBIT V-2

17. (Previously presented) An apparatus, comprising:

means for sampling a temperature associated with the operation of a processing unit within said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit; (B) and

means for using said prediction for automatic control of temperature within said apparatus. (C)

```
SetTrange:
     xchg    al,cl                   ;Al has temp back; ah=index
     mov     cx,7                    ;cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                   ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     je      FoundRange              ;CX=range number found
     loop    ScanRange
FoundRange:                          ;cx=range number found
     mov     al,39h                  ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,3                    ;Last Temperature range
     and     ah,0c0h                 ;Upper direction trend value
     cmp     cl,al                   ;Value of cmos read
     je      RangeStable             ;Stable process, same range
     jg      RangeUpward             ;New range is greater than
old one
;                                    ;Range is downward trend
     cmp     ah,10000000b            ;Lastone upward?
     je      RangeOSC                ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                 ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b            ;Last one Downward?
     je      RangeOSC                ;Yes, Osc found
     mov     ch,10

AllRange:
     or      ch,cl                   ;Range and range temp trend
     mov     ah,cl
     mov     al,39h                  ;Note that : clc inter 1
...
     Call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0003Ah               ;Free Channel
     mov     bl,10000000b            ;Mask to write
     call    CmosWriteMask           ;Bit updated
BusyKeyChannel:
     pop     cx                      ;3-18-95vw
     pop     bx                      ;3-18-95vw
     pop     ax                      ;3-18-95vw

     popf                            ;Restore status and
```

EXHIBIT V-4

(B) ... responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit

Prediction based on trends

EXHIBIT V-3

17. (Previously presented) An apparatus, comprising:
means for sampling a temperature associated with the operation of a processing unit within said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit; (B) and

means for using said prediction for automatic control of temperature within said apparatus. (C)

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBig2                 ;Not zero
        inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                       ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

EXHIBIT I-3

(B) ... responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit

Implementation functional
For prototype and patent purposes
By 9/15/1994

EXHIBIT V-4

17. (Previously presented) An apparatus, comprising:
means for sampling a temperature associated with the operation of a processing unit within said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit; (B) and

means for using said prediction for automatic control of temperature within said apparatus. (C)

TRange, direction, and time - sets auto control

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

EXHIBIT I-3

(C) ... using said prediction for automatic control of temperature within said apparatus



Implementation functional
For prototype and patent purposes
By 9/15/1994

17. (Previously presented) An apparatus, comprising:

means for sampling a temperature associated with the operation of a processing unit within said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said processing unit; (B) and

means for using said prediction for automatic control of temperature within said apparatus. (C)

(C) ... using said prediction for automatic control of temperature within said apparatus

```
;
;    Need to setup the Doze Value based on current TRange
;
     push    ax

IFDEF   zzzlilyp                        ;5.08.1 6-3-95vw Set Doze
Value
     mov     ah,byte ptr cs:TDozeTable[bx]
     mov     al,34h                     ; Index register to write
     call    CfgWrite
ENDIF   zzzlilyp

IFDEF   zzzlilyd                        ;5.08.1 6-3-95vw Add more
code here
ENDIF   zzzlilyd

     pop     ax                         ; Minutes to next scan
WriteDownCountT:
     mov     al,3ah
     call    CmosWrite                  ; Write it out
LeaveDownCountT:
     pop     bx
     pop     ax
     popf                               ;Restore Interrupts
     ret

TDozeTable:
     db      00h                        ; Disabled
     db      38h                        ; 2 sec's
     db      30h                        ; 1 sec
     db      28h                        ; 1/2 sec
     db      28h,28h,28h,28h,28h        ;4.48b  5-11-95
;        db      20h                    ; 1/4 sec
```

EXHIBIT X-3

Modifies clock signal – that controls temperature of apparatus. Register BX indexes TDozeTable for auto-selection and auto control.

Note:
This is original code that was present in FCC and UL code or before 9/15/94 – IFDEF zzzlilyp was added on 6-3-95 to delineate original code from any new code added later for IFDEF zzzlilyd

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lilyp products, the tables changed to under them also (see 4.48b 5-11-95)

EXHIBIT V-6

Implementation functional
For prototype and patent purposes
By 9/15/1994

<u>Claim 18</u>

18. (Previously presented) An apparatus, comprising:

means for sampling a temperature associated with the operation of said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus; (B) and means for using said prediction for automatic temperature control within said apparatus.(C)

```
    cmp     al,08h                  ;Time to read data from KB?
    je      DoKBThermalRead
    mov     al,?
    dec     al
    and     ah,NOT 38h              ;Keep theold stuff
    shl     al,3
    or      ah,al                   ;New value
    jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one. else we need to leave it along.
;
    call    UpdateTemperature       ;Do it
    mov     al,3ah
    call    CmosRead                ;Read Temperature byte
    mov     ah,al                   ;Direction/Time/Level
    and     ah,38h                  ;Just the time and level
please
    mov     bh,al                   ;Get the direction
    and     al,7                    ;Level computed for Temp
range
    and     bh,11000000b            ;Direction

    cmp     ah,0                    ;Good read?
    jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b            ;OSC?
    jne     NotTR_OSC               ;Nop!
```

EXHIBIT I-2

A sample

Temperatures and control signals are returned in CMOS storage area that is read by CMOSRead program

(A) ...sampling a temperature associated with the operation of a processing unit within said apparatus

Implementation functions
For protype and patent purposes
By 9 15 1994

EXHIBIT V-7

18. (Previously presented) An apparatus, comprising:

means for sampling a temperature associated with the operation of said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus; (B) and means for using said prediction for automatic temperature control within said apparatus.(C)

```
        cmp     al,08h                  ;Time to read data from KB?
        je      DoKBThermalRead
        shr     al,3
        dec     al
        and     ah,NOT 38h              ;Keep theold stuff
        shl     al,3
        or      ah,al                   ;New value
        jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     ah,al                   ;Direction/time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction

        cmp     ah,0                    ;Good read?
        jne     LeaveDownCountT         ;Nop, leave it along

;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTR_OSC               ;Nop!
```

Looking at direction, prediction Dependent on SetTrange and storing value in CMOS for this read.

(B) ... responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus

Implementation functional
For protype and patent purposes
By 9-15-1994

EXHIBIT I-2

EXHIBIT V-8

18. (Previously presented) An apparatus, comprising:

means for sampling a temperature associated with the operation of said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus; (B) and means for using said prediction for automatic temperature control within said apparatus.(C)

```
SetTrange:
     xchg    al,cl                  ;Al has temp back; ah=index
     mov     cx,7                   ;Cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                  ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange             ;cx=range number found
     loop    ScanRange
FoundRange:                          ;cx=range number found

     mov     al,39h                 ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     cl,ah
     and     al,3                   ;Last Temperature range
     and     ah,0C0h                ;Upper direction trend value
     cmp     cl,al                  ;Value of cmos read
     je      RangeStable            ;Stable process, same range
     jg      RangeUpward            ;New range is greater than
old one
;                                    ;Range is downward trend
     cmp     ah,10000000b           ;Lastone upward?
     je      RangeOSC               ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0C0h                ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b           ;Last one Downward?
     je      RangeOSC               ;Yes, Osc found
     mov     ch,10
```

```
AllRange:
     or      ch,cl                  ;Range and range temp trend
     mov     ah,cl
     mov     al,39h                 ;Note that I dir inner ;
Save for ...
     Call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0003Bh              ;Free Channel
     mov     bl,10000000b           ;Mask to write
     call    CmosWriteMask          ;Bit updated
BusyKeyChannel1:
     pop     dx                     ;3-18-95vw
     pop     bx                     ;3-18-95vw
     pop     ax                     ;3-18-95vw

     popf                           ;Restore status and

                    EXHIBIT 1-9
```

(B) ... responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus

Prediction based on trends

[redacted]

EXHIBIT V-9

18. (Previously presented) An apparatus, comprising:

means for sampling a temperature associated with the operation of said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus; (B) and means for using said prediction for automatic temperature control within said apparatus.(C)

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

EXHIBIT I-3

(B) ... responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus

Implementation functional
For prototype and patent purposes
By 9/15/1994

EXHIBIT V-10

18. (Previously presented) An apparatus, comprising:

means for sampling a temperature associated with the operation of said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus; (B) and means for using said prediction for automatic temperature control within said apparatus.(C)

TRange, direction, and time - sets auto control

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

EXHIBIT I-3

(C) ... using said prediction for automatic control of temperature within said apparatus

EXHIBIT V-11

Implementation functional
For prototype and patent purposes
By 9/15/1994

18. (Previously presented) An apparatus, comprising:

means for sampling a temperature associated with the operation of said apparatus; (A)

means, responsive to said sampled temperature, for predicting future temperature associated with the operation of said apparatus; (B) and means for using said prediction for automatic temperature control within said apparatus.(C)

(C) ... using said prediction for automatic control of temperature within said apparatus

```
;
;     Need to setup the Doze Value based on current TRange
;
      push    ax

IFDEF   zzzlilyp                        ;5.08.1 6-3-95vw Set Doze
Value
      mov     ah,byte ptr cs:TDozeTable[bx]
      mov     al,54h                    ; index register to write
      call    CTCWrite
ENDIF   ;zzzlilyp

IFDEF   zzzlilyd                        ;5.08.1 6-3-95vw Add code
Code here
ENDIF   ;zzzlilyd

      pop     ax                        ; Minutes to next scan
WriteDownCount?:
      mov     al,3ah
      call    CmosWrite                 ; Write it out
LeaveDownCount?:
      pop     bx
      pop     ax
      popf                              ;Restore interrupts
      ret

TDozeTable:
      db      00h                       ; Disabled
      db      38h                       ; 2 sec's
      db      30h                       ; 1 sec
      db      28h                       ; 1/2 sec
      db      28h,28h,28h,28h,28h       ;4.48b  5-11-95
;     db      20h                       ; 1/4 sec
```

EXHIBIT X-3

Modifies clock signal – that controls temperature of apparatus. Register BX indexes TDozeTable for auto-selection and auto control.

Note:
This is original code that was present in FCC and UL code or before 9/15/94 – IFDEF zzzlilyp was added on 6-3-95 to delineate original code from any new code added later for IFDEF zzzlilyd

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lilyp products, the tables changed to under them also (see 4.48b 5-11-95)

Implementation functional
For prototype and patent purposes
By 9/15/1994

EXHIBIT V-12

# Claims 19 and 20

19. (Previously presented) The apparatus of Claim 17, including means for user modification of said temperature predictions. (D)

20. (Previously presented) The apparatus of Claim 18, including means for user modification of said temperature predictions. (D)

Auto/on/off set by user in SETUP

Implementation functional
For prototype and patent purposes
By 3-24-1995

```
;
;       Smart range coded added 3-12-95vw
;       Allow user to select which range of thermal management he
wants
;       Power Saving = ON --DC range
;                      OFF -AC range
;                      AUTO -If AC operation, using AC range
;                           -If DC operation, using DC range
;
```

(D) The apparatus ... including means for user modification of said temperature predictions

EXHIBIT I-7

```
;
;      3-24-95 Added Auto/On?off selection
;
    mov     al,66h
    call    CmosRead                ;Get Auto/On/Off Selection
```

Note: this feature was added after code was converted to ROM based needed for production as an enhancement to technology in Mar 1995. Dischler did NOT provide auto selection by user.

EXHIBIT V-13

# Claim 21

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

```
    cmp     al,08h                  ;Time to read data from KB?
    je      DoKBThermalRead
    dec     al
    and     ah,NOT 38h              ;Keep theold stuff
    shl     al,3
    or      ah,al                   ;New value
    jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management bit; return time count = 0
then
;       we had one, else we need to leave it along.
;
    call    UpdateTemperature       ;Do it
    mov     al,3ah
    call    CmosRead                ;Read Temperature byte
    mov     ah,al                   ;Direction/Time/Level
    and     ah,38h                  ;Just the time and level
please
    mov     bh,al                   ;Get the direction
    and     al,7                    ;Level computed for Temp
range
    and     bh,11000000b            ;Direction

    cmp     ah,0                    ;Good read?
    jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b            ;OSC?
    jne     NotTR_OSC               ;Nop!
```

EXHIBIT I-2

A sample

Temperatures and control signals are returned in CMOS storage area that is read by CMOSRead program

(A) ... sampling a temperature within said apparatus

Implementation functional
For protype and patent purposes
By 8/15/1994

EXHIBIT V-14

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

```
. . . .
    cmp     al,08h              ;Time to read data from KB?
    je      DoKBThermalRead
    shr     al,3
    dec     al
    and     ah,NOT 38h          ;Keep theold stuff
    shl     al,3
    or      ah,al               ;New value
    jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
    call    UpdateTemperature   ;Do it
    mov     al,3ah
    call    CmosRead            ;Read Temperature byte
    mov     ah,al               ;Direction/Time/Level
    and     ah,38h              ;Just the time and level
please
    mov     bh,al               ;Get the direction
    and     al,7                ;Level computed for Temp
range
    and     bh,11000000b        ;Direction

    cmp     ah,0                ;Good read?
    jne     LeaveDownCountT     ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b        ;OSC?
    jne     NotTR_OSC           ;Nop!
```

(E) using said sampled temperature at least once as a starting point

Sampled Temperature
Returned in CMOS Storage area.
Read CMOS storage to fetch sample point
(also returns "trends" found with sample point for later prediction)

Valid sampled temperature

Implementation functional
For prototype and patent purposes
By 9/15/1994

EXHIBIT I-2

EXHIBIT V-15

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

```
SetRange:
     xchg    al,cl                      ;Al has temp back; ah=index
     mov     cx,7                       ;cx = loop count
ScanRange:
     mov     bx,cx
     add     bl,ah                      ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange                 ;CX=range number found
     loop    ScanRange
FoundRange:                               ;cx=range number found

     mov     al,39h                     ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,3                       ;Last Temperature range
     and     ah,0c0h                    ;Upper direction trend value
     cmp     cl,al                      ;Value of cmos read
     je      RangeStable                ;Stable process, same range
     jg      RangeUpward                ;New range is greater than
old one
;                                         ;Range is downward trend
     cmp     ah,10000000b               ;Lastone upward?
     je      RangeOSC                   ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                    ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b               ;Last one Downward?
     je      RangeOSC                   ;Yes. Osc found
     mov     ch,10
```

(E) using said sampled temperature at least once as a starting point

[redacted]

Sampled Temperature
Returned in CMOS Storage area in register AL.

Prediction Work
based on sample
as starting point

Exhibit I-8

EXHIBIT V-16

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

```
. . . . . .
     cmp     al,08h                    ;Time to read data from KB?
     je      DoKBThermalRead
     shr     al,3
     dec     al
     and     ah,NOT 38h                ;Keep theold stuff
     shl     al,3
     or      ah,al                     ;New value
     jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit; return time count = 0
then
;       we had one, else we need to leave it along.
;
     call    UpdateTemperature         ;Do it
     mov     al,3Ah
     call    CmosRead                  ;Read Temperature byte
     mov     al,ah                     ;Direction/Time/Level
     and     ah,38h                    ;Just the time and level
please
     mov     bh,al                     ;Get the direction
     and     al,7                      ;Level computed for Temp
range
     and     bh,11000000b              ;Direction
     cmp     ah,0                      ;Good read?
     jne     LeaveDownCountT           ;Nop; leave it along
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
     cmp     bh,11000000b              ;OSC?
     jne     NotTR_OSC                 ;Nop!
```

EXHIBIT I-2

Looking at direction, prediction Dependent on SetTrange and storing value in CMOS for this read.

(B) ... predicting future changes in said temperature

Implementation functional
For protype and patent purposes
By 9/15/1994

EXHIBIT V-17

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

```
SetTrange:
     xchg    al,cl                        ;Al has temp back; ah=index
     mov     cx,7                         ;cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                        ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange                   ;cx=range number found
     loop    ScanRange
FoundRange:                               ;cx=range number found
     mov     al,39h                       ;Read Keyboard channel
access flag
     call    CmosRead
     mov     al,ah
     and     al,3                         ;Last Temperature range
     and     ah,0c0h                      ;Upper direction trend value
     cmp     cl,al                        ;Value of cmos read
     je      RangeStable                  ;Stable process, same range
     jg      RangeUpward                  ;New range is greater than
old one
;                                         ;Range is downward trend
     cmp     ah,10000000b                 ;Lastone upward?
     je      RangeOSC                     ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                      ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b                 ;Last one Downward?
     je      RangeOSC                     ;Yes. Osc found
     mov     ch,10

AllRange:
     or      ch,cl                        ;Range and range temp trend
     mov     ah,cl
     mov     al,39h                       ;Note that [illegible]
[illegible]
     call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0887Bh                    ;Free Channel
     mov     bl,10000000b                 ;Mask to write
     call    CmosWriteMask                ;Bit updated
BusyKeyChannel:
     pop     cx                           ;[illegible]
     pop     bx                           ;[illegible]
     pop     ax                           ;[illegible]

     popf                                 ;Restore status and
```

EXHIBIT V-8

(B) ... predicting future changes in said temperature

Prediction based on trends

EXHIBIT V-18

[redacted]

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBig2                 ;Not zero
        inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

EXHIBIT I-3

(B) ... predicting future changes in said temperature

EXHIBIT V-19

Implementation functional
For prototype and patent purposes
By 9/15/1994

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

TRange, direction, and time - sets auto control

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

EXHIBIT I-3

(C) ... responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit,

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

(C) ... responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit,

```
;
;       Need to setup the Doze Value based on current TRange
;
        push    ax

IFDEF   zzzlilyp                        ;5.08.1 6-3-95vw Set Doze
Value
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,54h                  ; Index register to write
        call    CDpWrite
ENDIF   ;zzzlilyp

IFDEF   zzzlilyd                        ;5.08.1 6-3-95vw add doze
code here
ENDIF   ;zzzlilyd

        pop     ax                      ; Minutes to next scan
WriteDownCountT:
        mov     al,3ah
        Call    CmosWrite               ; Write it out
LeaveDownCountT:
        pop     bx
        pop     ax
        popf                            ;Restore Interrupts
        ret

TDozeTable:
        db      0Ch                     ; Disabled
        db      38h                     ; 2 sec's
        db      30h                     ; 1 sec
        db      28h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4.48b  5-11-95
;       db      20h                     ; 1/4 sec
```

EXHIBIT V-3

Modifies clock signal – that controls temperature of apparatus. Register BX indexes TDozeTable for auto-selection and auto control.

Note:
This is original code that was present in FCC and UL code or before 9/15/94 – <u>IFDEF zzzlilyp was added on 6-3-95 to delineate original code from any new code added later for IFDEF zzzlilyd</u>

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lillyp products, the tables changed to under them also (see 4.48b 5-11-95)

Implementation functional
For prototype and patent purposes
By 9/15/1994

EXHIBIT V-21

21. (Previously presented) An apparatus, comprising:

means for sampling a temperature within said apparatus (A) and, using said sampled temperature at least once as a starting point, (E) predicting future changes in said temperature; (B) and

means, responsive to said means for sampling and predicting, for automatically adjusting the processing speed of a processing unit by modifying a clock signal utilized by the processing unit, (C) to maintain said temperature within said apparatus below a selected reference temperature. (F)

(F) maintain said temperature within said apparatus below a selected reference temperature.

Sets Value to keep temperature below referenced in table

```
SetTrange:
     xchg    al,cl                  ;Al has temp back: ah=index
     mov     cx,7                   ;cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                  ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange             ;CX=range number found
     loop    ScanRange
FoundRange:                         ;CX=range number found

     mov     al,39h                 ;Read Keyboard channel
access flag
     call    CmosRead
     mov     al,ah
     and     al,3                   ;Last Temperature range
     and     ah,0C0h                ;Upper direction trend value
     cmp     cl,al                  ;Value of cmos read
     je      RangeStable            ;Stable process, Same range
     jg      RangeUpward            ;New range is greater than
old one
;                                   ;Range is downward trend
     cmp     ah,10000000b           ;Lastone upward?
     je      RangeOSC               ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0C0h                ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b           ;Last one Downward?
     je      RangeOSC               ;Yes. Osc found
     mov     ch,10
```

EXHIBIT V-22

```
AllRange:
     or      ch,cl                  ;Range and range temp trend
     mov     ah,cl
     mov     al,39h                 ;Note that I clr inter ?
bits for status complete
     call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0003Bh              ;Free Channel
     mov     bl,10000000b           ;Mask to write
     call    CmosWriteMask          ;Bit updated
BusyKeyChannel:
     pop     cx                     ;>(8-95vw
     pop     bx                     ;>(8-95vw
     pop     ax                     ;>(8-95vw

     popf                           ;Restore status and
```

EXHIBIT [illegible]

```
     TempRange        label   byte
     DCTempRange      label   byte
              db      0ch              ;Level 0
              db      0eh              ;Level 1
              db      10h              ;Level 2
              db      12h              ;Level 3
              db      14h              ;Level 4
              db      16h              ;Level 5
              db      18h              ;Level 6
              db      1ah              ;Level 7

     ACTempRange      label   byte
              db      18h              ;Level 0
              db      1bh              ;Level 1
              db      1dh              ;Level 2
              db      1fh              ;Level 3
              db      21h              ;Level 4
              db      23h              ;Level 5
              db      25h              ;Level 6
              db      27h              ;Level 7

     UpdateTemperature    endp
```

EXHIBIT [illegible]

# Claim 23

23. (Previously presented) The apparatus of Claim 21, wherein said adjustments are accomplished within the processing unit cycles and do not affect the user's perception of performance. (G)

Sample interval selected as to not be detected by user or affect user performance

```
        cmp     al,0Ah                  ;Time to read data from EC?
        je      DoXXThermalRead
        shr     al,3
        dec     al
        and     ah,NOT 38h              ;Keep theold stuff
        shl     al,3
        or      ah,al                   ;New value
        jmp     WriteDownCount?
DoXXThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     al,ah                   ;Direction/Time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction

        cmp     ah,0                    ;Good read?
        jne     LeaveDownCount?         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTR_OSC               ;Nop!
```

EXHIBIT I-2

```
        pop     ax                              ; Minutes to next scan
WriteDownCount?:
        mov     al,3ah
        call    CmosWrite                       ; Write it out
LeaveDownCount?:
        pop     dx
        pop     ax
        popf                                    ;Restore Interrupts
        ret

TDozeTable:
        db      00h                             ; Disabled
        db      38h                             ; 2 sec's
        db      30h                             ; 1 sec
        db      28h                             ; 1/2 sec
        db      28h,28h,28h,28h,28h             ;Y,K8b  5-11-98
;               db      20h                     ; 1/4 sec
```

EXHIBIT I-3

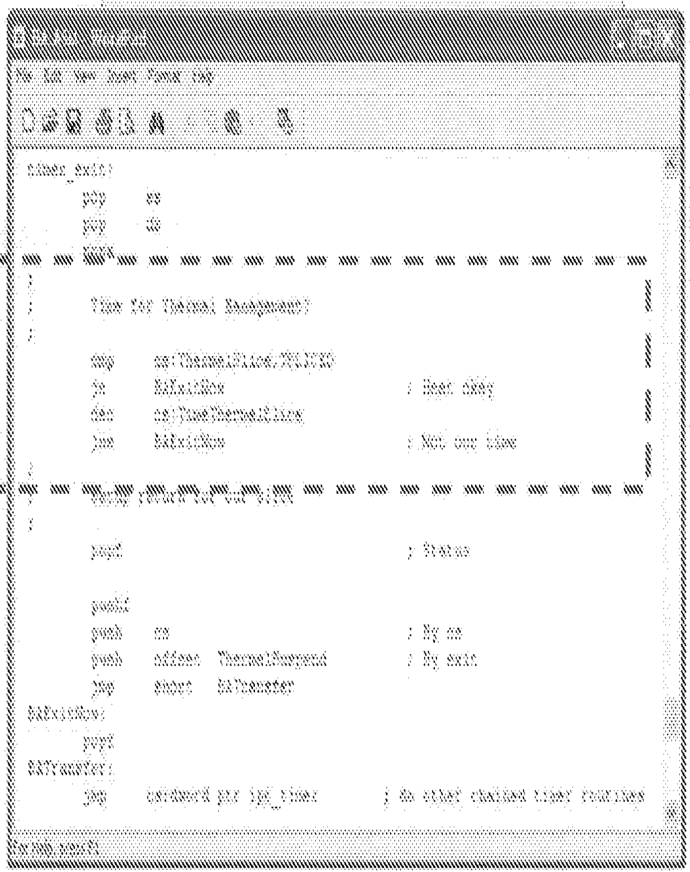
(G) … said adjustments are accomplished within the processing unit cycles and do not affect the user's perception of performance.

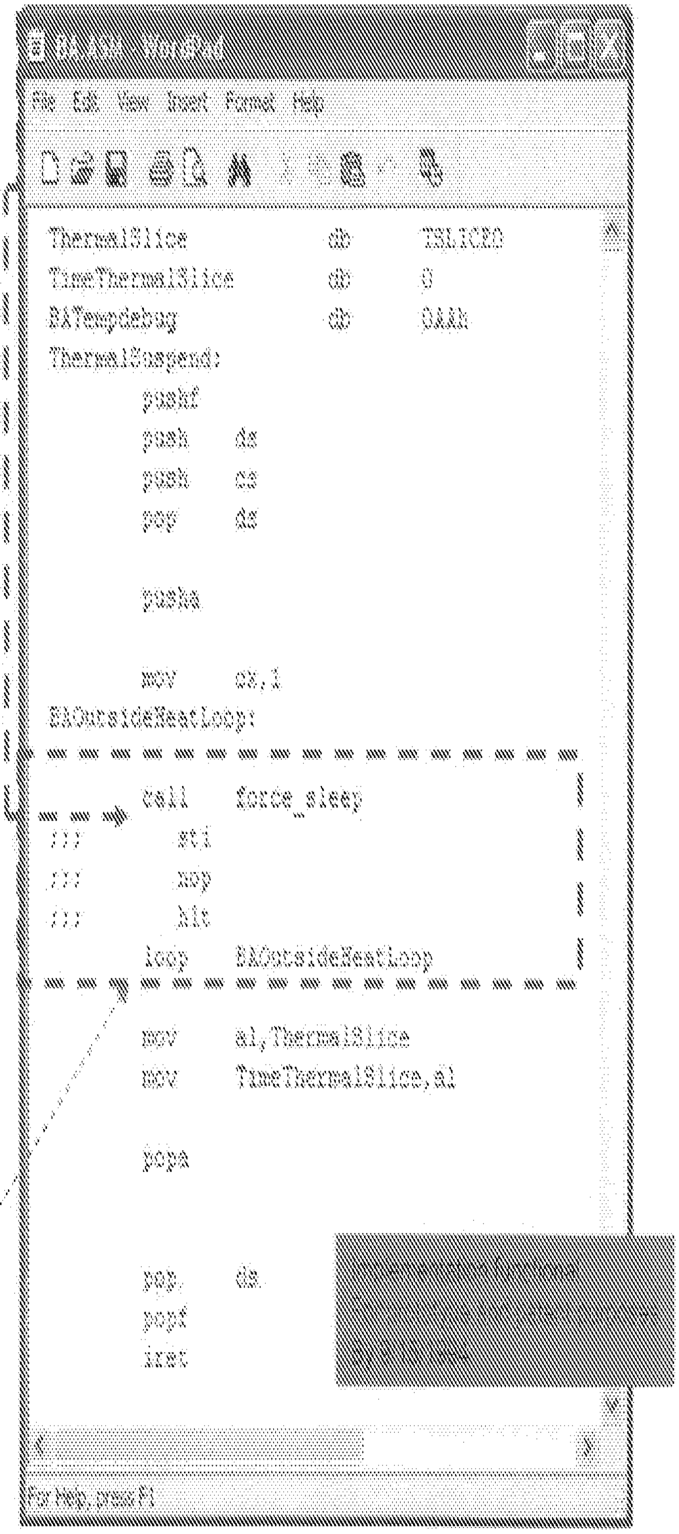
[redacted]

23. (Previously presented) The apparatus of Claim 21, wherein said adjustments are accomplished within the processing unit cycles and do not affect the user's perception of performance. (G)

(G) … said adjustments are accomplished within the processing unit cycles and do not affect the user's perception of performance.

Thermal Management Event –




forcing cool down loop – really a "one shot" since CX=1

Sample interval selected as to not be detected by user or affect user performance

Exhibit BA.ASM-5

# Claim 74

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

(T) a temperature controller ...

DoKBThermalRead calls Temperature Controller: "UpdateTemperature"

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.

        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     al,ah                   ;Direction/Time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction

        cmp     ah,0                    ;Good read?
        jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b
        jne     NotTR_OSC
```

[redacted]

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

(T) a **temperature controller ...**

```
;
;       Read the Temperature on the system board controlled by
Keyboard Controller
;
;       Calling Arguments
;
;       Call    UpDateTemperature
;       ON exit, the cmos parameter will contain the correct
values
;
```

The Temperature Controller

EXHIBIT I-4

[redacted]

```
        mov     al,0c4h                 ;Output the read A/D.
        out     64h,al
testkbc_2:
        loop    testKbc_2_Okay          ;3-30-95vw Don't hang here
        jmp     ClearBusyKeyChannel     ;3-30-95vw?Should we flush
here?
testkbc_2_Okay:                         ;3-30-95vw
        jmp     $+2
        in      al,64h                  ;read status port
        jmp     $+2
        jmp     $+2
        test    al,2                    ;check status of input port
```

EXHIBIT I-5

```
        in      al,60h                  ;full, then, get A/D value

        cmp     al,0ffh                 ;valid value?
        je      ClearBusyKeyChannel     ;Nop!           3-17-95vw
                        ;DEBUG CODE..WAtts 3-13-95vw INACTIVE
        cmp     al,00h
        je      ClearBusyKeyChannel     ;Nop!   3-17-95vw
        push    ax
        mov     ah,55h
        xchg    al,ah
```

EXHIBIT I-6

Reads Temperature for starting point

Register al contains temperature

Note: Channels 64 was changed to 54 and 60 was changed to 50 after 9/15/94. Does not affect invention, just make product work better for multitasking operating systems. Same temperature was obtained either way. Channels 60 and 64 used for FCC and UL agency testing. Implementation was functional and complete for patent purpose by 9/15/94.

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

```
        cmp     al,06h                  ;Time to read data from X3?
        je      DoX3ThermalRead
        shr     al,3
        dec     al
        and     ah,NOT 18h              ;Keep theold stuff
        shl     al,3
        or      ah,al                   ;New value
        jmp     WriteDownCountT

DoX3ThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one. else we need to leave it along.
;
        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     ah,al                   ;Direction/time/level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction

        cmp     ah,0                    ;Good read?
        jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTR_OSC               ;Nop!
```

(E) ... using said sampled temperature at least once as a starting point

Sampled Temperature
Returned in CMOS Storage area.
Read CMOS storage to fetch sample point
(also returns "trends" found with sample point for later prediction)

Valid sampled temperature

EXHIBIT I-2

Implementation functional
For prototype and patent purposes
By 9-15-1994

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

```
SetTrange:
     xchg    al,cl                   ;Al has temp back; ah=index
     mov     cx,7                    ;cx = loop count
ScanRange:
     mov     BX,CX
     add     bl,ah                   ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange              ;CX=range number found
     loop    ScanRange
FoundRange:                             ;cx=range number found

     mov     al,39h                  ;Read Keyboard channel
access flag
     call    CmosRead
     mov     al,ah
     and     al,3                    ;Last Temperature range
     and     ah,0C0h                 ;Upper direction trend value
     cmp     cl,al                   ;Value of cmos read
     je      RangeStable             ;Stable process, same range
     jg      RangeUpward             ;New range is greater than
old one
;                                       ;Range is downward trend
     cmp     ah,10000000b            ;Lastone upward?
     je      RangeOSC                ;Yes, found osc
     mov     ch,81h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0C0h                 ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b            ;Last one Downward?
     je      RangeOSC                ;Yes, Osc found
     mov     ch,10
```

(E) using said sampled temperature at least once as a starting point

[illegible]

Sampled Temperature
Returned in CMOS Storage area in register AL.

Prediction Work
based on sample
as starting point

Exhibit I-8

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

```
    cmp     al,08h                  ;Time to read data from KB?
    je      DoKBThermalRead
    shr     al,3
    dec     al
    and     ah,NOT 38h              ;Keep theold stuff
    shl     al,3
    or      ah,al                   ;New value
    jmp     WriteDownCount?

DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it alone.
;
    call    UpdateTemperature       ;Do it
    mov     al,3Ah
    call    CmosRead                ;Read Temperature byte
    mov     ah,al                   ;Direction/Time/Level
    and     ah,38h                  ;Just the time and level
please
    mov     bh,al                   ;Get the direction
    and     al,7                    ;Level computed for Temp
range
    and     bh,11000000b            ;Direction
    cmp     ah,0                    ;Good read?
    jne     LeaveDownCount?         ;Nop, leave it alone
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b            ;OSC?
    jne     NotTR_OSC               ;Nop!
```

Looking at direction, prediction Dependent on SetTrange and storing value in CMOS for this read.

(B) ... predicting future changes in said temperature

Implementation functional
For protoype and patent purposes
By 6/15/1994

EXHIBIT I-2

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

```
SetTrange:
     xchg    al,cl                   ;Al has temp back; ah=index
     mov     cx,7                    ;Cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                   ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange              ;CX=range number found
     loop    ScanRange
FoundRange:                           ;Cx=range number found
     mov     al,39h                  ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,3                    ;Last Temperature range
     and     ah,0c0h                 ;Upper direction trend value
     cmp     cl,al                   ;Value of cmos read
     je      RangeStable             ;Stable process. Same range
     jg      RangeUpward             ;New range is greater than
old one
;                                     ;Range is downward trend
     cmp     ah,10000000b            ;Lastone upward?
     je      RangeOSC                ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                 ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b            ;Last one Downward?
     je      RangeOSC                ;Yes. Osc found
     mov     ch,10
```

```
AllRange:
     or      cl,ch                   ;Range and range temp trend
     mov     ah,cl
     mov     al,39h                  ;Note that I ...
[illegible]
     Call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0003Fh               ;Free channel
     mov     bl,10000000b            ;Mask to write
     call    CmosWriteMask           ;Bit updated
BusyKeyChannel:
     pop     cx                      ;3-18-93vw
     pop     bx                      ;3-18-93vw
     pop     ax                      ;3-18-93vw

     popf                            ;Restore status and

                  EXHIBIT 1-8
```

(B) ... predicting future changes in said temperature

Prediction based on trends

EXHIBIT V-30

[redacted]

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

```
;
;        OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;        Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBig2                 ;Not zero
        inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

EXHIBIT I-3

(B) ... predicting future changes in said temperature

Predicting future changes
By studying trend to be downward,
Upward, stable, or oscillating.

Implementation functional
For prototype and patent purposes
By 3/15/1994

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

(M) a **clock manager ...**

The Temperature Controller

The Clock Manager – receives control signal from temperature controller

```
DoKBThermalRead:

;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.

        call    UpdateTemperature           ;Do it
        mov     al,3ah
        call    CmosRead                    ;Read Temperature byte
        mov     al,ah                       ;Direction/Time/Level
        and     ah,38h                      ;Just the time and level
please
        mov     bh,al                       ;Get the direction
        and     al,7                        ;Level computed for Temp
range
        and     bh,11000000b                ;Direction

        cmp     ah,0                        ;Good read?
        jne     LeaveDownCountT             ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b                ;OSC?
        jne     NotTR_OSC                   ;Nop!
```

[redacted]

EXHIBIT I-2

EXHIBIT V-32

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

(S) to receive a **control signal** ...

```
DoXSThermalRead:

;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
        call    UpdateTemperature          ;Do it
        mov     al,3ah
        call    CmosRead                   ;Read Temperature byte
        mov     al,ah                      ;Direction/Time/Level
        and     ah,38h                     ;Just the time and level
please
        mov     bh,al                      ;Get the direction
        and     al,7                       ;Level computed for Temp
range
        and     bh,11000000b               ;Direction

        cmp     ah,0                       ;Good read?
        jne     LeaveDownCount?            ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b               ;OSC?
        jne     NotTR_OSC                  ;Nop!
```

[redacted]

EXHIBIT I-2

EXHIBIT V-33

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

(P) … clock manager selectively stopping clock signals … a) said monitored temperature rises to at least a selected reference temperature …
b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
    call    UpdateTemperature       ;Do it
    mov     al,3ah
    call    CmosRead                ;Read Temperature byte
    mov     al,ah                   ;Direction/Time/Level
    and     ah,38h                  ;Just the time and level
please
    mov     bh,al                   ;Get the direction
    and     al,7                    ;Level computed for Temp
range
    and     bh,11000000b            ;Direction

    cmp     ah,0                    ;Good read?
    jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b            ;OSC?
    jne     NotTR_OSC               ;Nop!
```

Valid Temperature found

[redacted]

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

(P) ... clock manager selectively stopping clock signals ... a) said monitored temperature rises to at least a selected reference temperature ...
b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

Modifies clock signal

```
;
;       Need to setup the Doze Value based on current TRange
;

IFDEF   zzzlilyp                        ;3.08.1 6-3-95rw Set Doze
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,34h                  ; Index register to write
        call    CfgWrite
ENDIF   ;zzzlilyp

IFDEF   zzzlilyd                        ;3.08.1 6-3-95rw Add doze
code here
ENDIF   ;zzzlilyd

        pop     ax                      ; Minutes to next scan
WriteDownCount?:
        mov     al,3ah
        Call    CmosWrite               ; Write it out
LeaveDownCount?:
        pop     bx
        pop     ax
        popf                            ;Restore Interrupts
        ret

TDozeTable:
        db      00h                     ; Disabled
        db      3Bh                     ; 2 sec's
        db      3Ah                     ; 1 sec
        db      28h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4.48b  5-11-95
;       db      20h                     ; 1/4 sec
```

EXHIBIT 1-3

Reference Temperature

EXHIBIT V-35

```
TempRange       label   byte
DCTempRange     label   byte
        db      0Ch             ;Level 0
        db      0Eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1Ah             ;Level 7

ACTempRange     label   byte
        db      18h             ;Level 0
        db      1Bh             ;Level 1
        db      1Dh             ;Level 2
        db      1Fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpdateTemperature       endp
```

EXHIBIT 1-9

[redacted]

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lillyp products, the tables changed to under them also (see 4.48b 5-11-95)

74. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (P)

(P) ... clock manager selectively stopping clock signals ... a) said monitored temperature rises to at least a selected reference temperature ...
b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

[redacted]

EXHIBIT I-3

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper Index.
;
```

Tlevel sets time – based on acceptable level of temperature rise or fall (direction gives rise or fall, and TRange give temperature Low and Max in range. Acceptable rate is time and temperature based dependent on direction of trend.

# Claim 75

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

(T) a temperature controller ...

DoKBThermalRead calls Temperature Controller: "UpdateTemperature"

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
        call    UpdateTemperature           ;Do it
        mov     al,3ah
        call    CmosRead                    ;Read Temperature byte
        mov     al,ah                       ;Direction/Time/Level
        and     ah,38h                      ;Just the time and level
please
        mov     bh,al                       ;Get the direction
        and     al,7                        ;Level computed for Temp
range
        and     bh,11000000b                ;Direction

        cmp     ah,0                        ;Good read?
        jne     LeaveDownCountT             ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b
        jne     NotTR_OSC
```

[redacted]

EXHIBIT I-2

EXHIBIT V-37

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

(T) a **temperature controller ...**

```
;
;       Read the Temperature on the system board controlled by
Keyboard Controller
;
;       Calling Arguments
;
;       Call    UpDateTemperature
;       ON exit, the cmos parameter will contain the correct
values
;
```

The Temperature Controller

EXHIBIT I-4

[redacted]

```
        mov     al,0c4h                 ;Output the read A/D.
        out     54h,al
testkbc_2:
        loop    testkbc_2_Okay          ;3-10-95vw Don't hang here
        jmp     ClearBusyKeyChannel     ;3-10-95vw?Should we flush
here?
testkbc_2_Okay:                         ;3-10-95vw
        jmp     $+2
        in      al,54h                  ;read status port
        jmp     $+2
        jmp     $+2
        test    al,2                    ;check status of input port
```

EXHIBIT I-5

Reads Temperature for starting point

```
        in      al,50h                  ;Full, then, get A/D value

        cmp     al,0ffh                 ;valid value?
        je      ClearBusyKeyChannel     ;Nop!        3-17-95vw
                ;DEBUG CODE,.Watts 3-12-95vw INACTIVE
        cmp     al,00h
        je      ClearBusyKeyChannel     ;Nop!  3-17-95vw
        push    ax
        mov     ah,55h
        xchg    al,ah
```

EXHIBIT I-6

Register al contains temperature

Note: Channels 64 was changed to 54 and 60 was changed to 50 after 9/15/94. Does not affect invention, just make product work better for multitasking operating systems. Same temperature was obtained either way. Channels 60 and 64 used for FCC and UL agency testing. Implementation was functional and complete for patent purpose by 9/15/94.

EXHIBIT V-38

75. (Previously presented) An apparatus, comprising:

a <u>**temperature controller**</u> (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a <u>**clock manager**</u> (M) adapted to receive a <u>**control signal**</u> (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

```
    cmp     al,08h                  ;Time to read data from KB?
    je      DoKBThermalRead
    shr     al,3
    dec     al
    and     ah,NOT 38h              ;Keep theold stuff
    shl     al,3
    or      ah,al                   ;New value
    jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
    call    UpdateTemperature       ;Do it
    mov     al,3ah
    call    CmosRead                ;Read Temperature byte
    mov     ah,al                   ;DIRECTION/TIME/LEVEL
    and     ah,38h                  ;Just the time and level
please
    mov     bh,al                   ;Get the direction
    and     al,7                    ;Level computed for Temp
range
    and     bh,11000000b            ;Direction

    cmp     ah,0                    ;Good read?
    jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b            ;OSC?
    jne     NotTR_OSC               ;Nop!
```

EXHIBIT I-2

(E) ... using said sampled temperature at least once as a starting point

Sampled Temperature
Returned in CMOS Storage area.
Read CMOS storage to fetch sample point
(also returns "trends" found with sample-point for later prediction)

Valid sampled temperature

Implementation functional
For prototype and patent purposes
By 9/15/1994

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

```
SetTrange:
     xchg    al,cl                         ;Al has temp back; ah=index
     mov     cx,7                          ;cx = loop count
ScanRange:
     mov     bx,cx
     add     bl,ah                         ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange                    ;CX=range number found
     loop    ScanRange
FoundRange:                                  ;cx=range number found

     mov     al,39h                        ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,3                          ;Last Temperature range
     and     ah,0c0h                       ;Upper direction trend value
     cmp     cl,al                         ;Value of cmos read
     je      RangeStable                   ;Stable process, same range
     jg      RangeUpward                   ;New range is greater than
old one
;                                            ;Range is downward trend
     cmp     ah,10000000b                  ;Lastone upward?
     je      RangeOSC                      ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                       ;Osc flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b                  ;Last one Downward?
     je      RangeOSC                      ;Yes. Osc found
     mov     ch,10
```

(E) using said sampled temperature at least once as a starting point

[redacted]

Sampled Temperature
Returned in CMOS Storage area in register AL.

Prediction Work based on sample as starting point

Exhibit I-8

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; **(B)** and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

```
    cmp     al,08h                  ;Time to read data from KB?
    je      DoKBThermalRead
    shr     al,1
    dec     al
    and     ah,NOT 38h              ;Keep theold stuff
    shl     al,3
    or      ah,al                   ;New value
    jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
    call    UpdateTemperature       ;Do it
    mov     al,3ah
    call    CmosRead                ;Read Temperature byte
    mov     al,ah                   ;Direction/Time/Level
    and     ah,38h                  ;Just the time and level
please
    mov     bh,al                   ;Get the direction
    and     al,7                    ;Level computed for Temp
range
    and     bh,11000000b            ;Direction
    cmp     ah,0                    ;Good read?
    jne     LeaveDownCountT         ;Nop, leave it along
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b            ;OSC?
    jne     NotTR_OSC               ;Nop!
```

EXHIBIT I-2

Looking at direction, prediction Dependent on SetTrange and storing value in CMOS for this read.

(B) ... predicting future changes in said temperature

Implementation functional
For protoype and patent purposes
By 9/15/1994

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

```
SetRange:
     xchg    al,cl                   ;Al has temp back; ah=index
     mov     cx,7                    ;CX = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                   ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange-bx]
     je      FoundRange              ;CX=range number found
     loop    ScanRange
FoundRange:                          ;cx=range number found
     mov     al,39h                  ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,3                    ;Last Temperature range
     and     ah,0c0h                 ;Upper direction trend value
     cmp     cl,al                   ;Value of cmos read
     je      RangeStable             ;Stable process, same range
     jb      RangeUpward             ;New range is greater than
old one
;                                    ;Range is downward trend
     cmp     ah,10000000b            ;Lastone upward?
     je      RangeOSC                ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                 ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b            ;Last one Downward?
     je      RangeOSC                ;Yes. Osc found
     mov     ch,10

AllRange:
     or      ch,al                   ;Range and range temp trend
     mov     ah,cl
     mov     al,3ah                  ;Gets that I clr later 1
     ... status complete
     Call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0003Bh               ;Free Channel
     mov     bl,10000000b            ;Mask to write
     call    CmosWriteMask           ;Bit updated
BusyKeyChannel:
     pop     cx                      ;3-18-93vw
     pop     bx                      ;3-18-93vw
     pop     ax                      ;3-18-93vw

     popf                            ;Restore status and

                        EXHIBIT 1-4
```

(B) ... predicting future changes in said temperature

Prediction based on trends



[redacted]

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; **(B)** and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                      ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

EXHIBIT I-3

(B) ... predicting future changes in said temperature

Predicting future changes:
By studying trend to be downward,
Upward, stable, or oscillating.

Implementation functional
For prototype and patent purposes
By 9/15/1994

EXHIBIT V-43

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

(M) a **clock manager ...**

The Temperature Controller

The Clock Manager – receives control signal from temperature controller

```
DoKBThermalRead:

;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.

        call    UpdateTemperature       ;Do it
        mov     al,38h
        call    CmosRead                ;Read Temperature byte
        mov     al,ah                   ;Direction/Time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction

        cmp     ah,0                    ;Good read?
        jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTR_OSC               ;Nop!
```

[redacted]

EXHIBIT I-2

EXHIBIT V-44

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

(S) to receive a **control signal** ...

```
DoKBThermalRead:

;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.

        call    UpdateTemperature               ;Do it
        mov     al,3ah
        call    CmosRead                        ;Read Temperature byte
        mov     al,ah                           ;Direction/Time/Level
        and     ah,38h                          ;Just the time and level
please
        mov     bh,al                           ;Get the direction
        and     al,7                            ;Level computed for Temp
range
        and     bh,11000000b                    ;Direction

        cmp     ah,0                            ;Good read?
        jne     LeaveDownCountT                 ;Nop, leave it along

;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b                    ;OSC?
        jne     NotTR_OSC                       ;Nop!
```

[redacted]

EXHIBIT 1-2

EXHIBIT V-45

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

(R) ... clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
    call    UpdateTemperature        ;Do it
    mov     al,3ah
    call    CmosRead                 ;Read Temperature byte
    mov     al,ah                    ;Direction/Time/Level
    and     ah,38h                   ;Just the time and level
please
    mov     bh,al                    ;Get the direction
    and     al,7                     ;Level computed for Temp
range
    and     bh,11000000b             ;Direction

    cmp     ah,0                     ;Good read?
    jne     LeaveDownCountT          ;Nop, leave it alone
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b             ;OSC?
    jne     NotTR_OSC                ;Nop!
```

Leaves clock speed the same "A 1st clock Signal"

Valid Temperature found, a 2nd Clock Signal if changed

[redacted]

EXHIBIT I-7

EXHIBIT V-46

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

(R) ... clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

Modifies clock signal

```
;
;       Need to setup the Doze Value based on current TRange
;

        IFDEF   xxxlilyp                        ;5.08.1 6-3-95ww Set Doze value
        mov     ah,byte ptr cs:[DozeTable+bx]
        mov     al,3Ah                          ; Index register to write
        call    CIgWrite
ENDIF   ;xxxlilyp

IFDEF   xxxlilyd                                ;5.08.2 6-3-95ww Add doze
Code here
ENDIF   ;xxxlilyd

        pop     AX                              ; Minutes to next scan
WriteDownCountT:
        mov     al,3ah
        call    CmosWrite                       ; Write it out
LeaveDownCountT:
        pop     bx
        pop     ax
        popf                                    ;Restore Interrupts
        ret

DozeTable:
        db      00h                             ; Disabled
        db      38h                             ; 2 sec's
        db      30h                             ; 1 sec
        db      28h                             ; 1/2 sec
        db      28h,28h,28h,28h,28h             ;4.48b 5-11-95
;       db      20h                             ; 1/4 sec
```

EXHIBIT I-3

Reference Temperature

EXHIBIT V-47

```
TempRange       label   byte
DCTempRange     label   byte
        db      0ch             ;Level 0
        db      0eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1Ah             ;Level 7

ACTempRange     label   byte
        db      19h             ;Level 0
        db      1ah             ;Level 1
        db      1dh             ;Level 2
        db      1fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpdateTemperature       endp
```

EXHIBIT I-9

[redacted]

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lillyp products, the tables changed to under them also (see 4.48b 5-11-95)

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

(R) ... clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

[redacted]

EXHIBIT E-3

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBig2                 ;Not zero
        inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     Bl,al                   ;TRange
        mov     Bh,0                    ;Upper index.
```

Tlevel sets time – based on acceptable level of temperature rise or fall (direction gives rise or fall, and TRange give temperature Low and Max in range. Acceptable rate is time and temperature based dependent on direction of trend.

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

(R) ... clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

```
;       OSC, so set the temp level up by one
;
    mov     bh,00000000b                ;Force downward
    cmp     al,7                        ;Already at max?
    je      NotTR_OSC                   ;yep, leave alone
    inc     al                          ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
    mov     ah,7                        ;Max  available
    sub     ah,al                       ;7-7 = 0 so watch it!
    cmp     ah,0
    jne     NotBigZ                     ;Not zero
    inc     ah                          ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
    or      ah,bh                       ;Align the direction
    or      ah,al                       ;Align the TRange
    mov     bl,al                       ;TRange
    mov     bh,0                        ;Upper Index.
;
;       Need to setup the Doze Value based on current TRange
;
    push    ax

IFDEF   ezzlilyp                        ;5.08.1 6-3-95vw Set Doze
value
    mov     ah,byte ptr cs:TDozeTable[bx]
    mov     al,54h                      ; Index register to write
    call    CfgWrite
```

Rising faster than Acceptable rate, forces second clock signal

[redacted]

Computes Clock Signal

Receive a First or Second clock signal

EXHIBIT V-49

75. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (S) from said temperature controller, said clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

(R) ... clock manager designating that a processing unit receives a first clock signal unless one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate, pursuant to which said clock manager designating that said processing unit receives a second clock signal. (R)

Rising faster than Acceptable rate, forces second clock signal

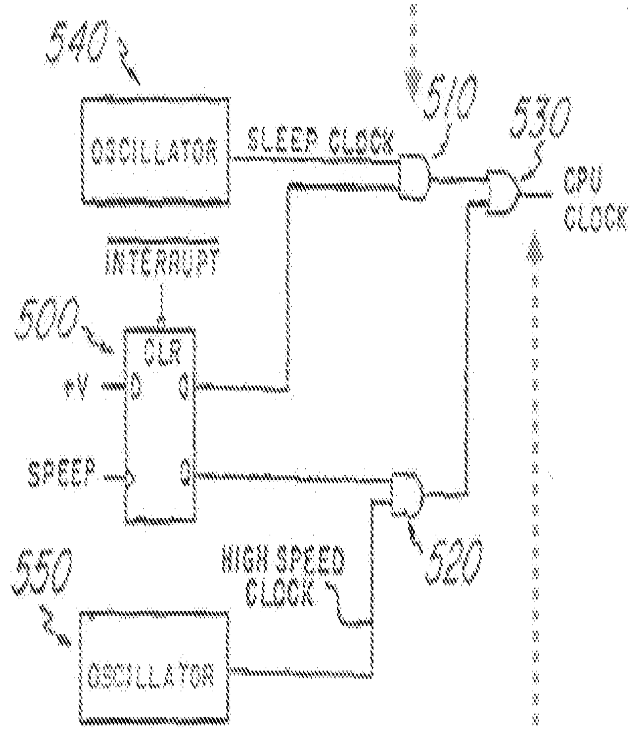



Fig. 3

[redacted]

Computes Clock Signal

Receive a First or Second clock signal

# Claim 76

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

(T) a **temperature controller ...**

DoKBThermalRead calls Temperature Controller: "UpdateTemperature"

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.

        call    UpdateTemperature          ;Do it
        mov     al,3ah
        call    CmosRead                   ;Read Temperature byte
        mov     al,ah                      ;Direction/Time/Level
        and     ah,38h                     ;Just the time and level
please
        mov     bh,al                      ;Get the direction
        and     al,7                       ;Level computed for Temp
range
        and     bh,11000000b               ;Direction

        cmp     ah,0                       ;Good read?
        jne     LeaveDownCountT            ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b
        jne     NotTR_OSC
```

[redacted]

EXHIBIT I-2

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

(T) a **temperature controller ...**

```
;
;       Read the Temperature on the system board controlled by
Keyboard Controller
;
;       Calling Arguments
;
;       Call    UpDateTemperature
;       ON exit, the cmos parameter will contain the correct
values
;
```

The Temperature Controller

EXHIBIT I-4

[redacted]

```
        mov     al,0eeh                 ;Output the read A/D.
        out     64h,al
testkbc_2:
        loop    testkbc_2_Okay          ;3-30-95vw Don't hang here
        jmp     ClearBusyKeyChannel     ;3-30-95vw?Should we flush
here?
testkbc_2_Okay:                         ;3-30-95vw
        jmp     $+2
        in      al,64h                  ;read status port
        jmp     $+2
        jmp     $+2
        test    al,2                    ;check status of input port
```

EXHIBIT I-5

```
        in      al,60h                  ;full. then, get A/D value

        cmp     al,0ffh                 ;valid value?
        je      ClearBusyKeyChannel     ;Nop!           3-17-95vw
                        ;DEBUG CODE..WAtts 3-12-95vw INACTIVE
        cmp     al,00h
        je      ClearBusyKeyChannel     ;Nop!   3-17-95vw
        push    ax
        mov     ah,53h
        xchg    al,ah
```

EXHIBIT I-6

Reads Temperature for starting point

Register al contains temperature

Note: Channels 64 was changed to 54 and 60 was changed to 50 after 9/15/94. Does not affect invention, just make product work better for multitasking operating systems. Same temperature was obtained either way. Channels 60 and 64 used for FCC and UL agency testing. Implementation was functional and complete for patent purpose by 9/15/94.

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

```
        cmp     al,08h                  ;Time to read data from KB?
        je      DoKBThermalRead
        shr     al,3
        dec     al
        and     ah,NOT 38h              ;Keep theold stuff
        shl     al,3
        or      ah,al                   ;New value
        jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit; return time count = 0
then
;       we had one, else we need to leave it along.
;
        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     ah,al                   ;Direction/Time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction

        cmp     ah,0                    ;Good read?
        jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTR_OSC               ;Nop!
```

(E) ... using said sampled temperature at least once as a starting point

Sampled Temperature
Returned in CMOS Storage area.
Read CMOS storage to fetch sample point
(also returns "trends" found with sample point for later prediction)

Valid sampled temperature

EXHIBIT I-2

Implementation functional
For prototype and patent purposes
By 9/15/1994

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

```
SetTrange:
     xchg    al,cl                  ;Al has temp back; ah=index
     mov     cx,7                   ;Cx = loop count
ScanRange:
     mov     bx,cx
     add     bl,ah                  ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange             ;CX=range number found
     loop    ScanRange
FoundRange:                           ;cx=range number found

     mov     al,39h                 ;Read Keyboard Channel
access flag
     call    CmosRead
     mov     al,ah
     and     al,3                   ;Last Temperature range
     and     ah,0c0h                ;Upper direction trend value
     cmp     cl,al                  ;Value of cmos read
     je      RangeStable            ;Stable process, same range
     jg      RangeUpward            ;New range is greater than
old one
;                                     ;Range is downward trend
     cmp     ah,10000000b           ;Lastone upward?
     je      RangeOSC               ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b           ;Last one Downward?
     je      RangeOSC               ;Yes, Osc found
     mov     ch,10
```

(E) using said sampled temperature at least once as a starting point

[redacted]

Sampled Temperature
Returned in CMOS Storage area in register AL.

Prediction Work
based on sample
as starting point

Exhibit I-8

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

```
        cmp     al,08h                  ;Time to read data from KB?
        je      DoKBThermalRead
        shr     al,1
        dec     al
        and     ah,NOT 38h              ;Keep theold stuff
        shl     al,3
        or      ah,al                   ;New value
        jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     ah,al                   ;Direction/Time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction
        cmp     ah,0                    ;Good read?
        jne     LeaveDownCountT         ;Nop, leave it along
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTB_OSC               ;Nop!
```

Looking at direction, prediction Dependent on SetTrange and storing value in CMOS for this read.

(B) ... predicting future changes in said temperature

Implementation functional
For protype and patent purposes
By 9/15/1994

EXHIBIT I-7

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

```
SetTrange:
     xchg    al,cl                    ;Al has temp back; ah=index
     mov     cx,7                     ;Cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                    ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jb      FoundRange               ;Cx=range number found
     loop    ScanRange
FoundRange:                           ;Cx=range number found
     mov     al,39h                   ;Read keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,3                     ;Last Temperature range
     and     ah,0c0h                  ;Upper direction trend value
     cmp     cl,al                    ;Value of cmos read
     je      RangeStable              ;Stable process, same range
     jg      RangeUpward              ;New range is greater than
old one
;                                     ;Range is downward trend
     cmp     ah,10000000b             ;Lastone upward?
     je      RangeOSC                 ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                  ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b             ;Last one Downward?
     je      RangeOSC                 ;Yes. Osc found
     mov     ch,10

AllRange:
     or      ch,cl                    ;Range and range temp trend
     mov     ah,cl
     mov     al,39h                   ;Note that I dir inter 1
Save the trend together
     Call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0003Bh                ;Free Channel
     mov     bl,10000000b             ;mask to write
     call    CmosWriteMask            ;Bit updated
BusyKeyChannel:
     pop     CX                       ;3-18-95vw
     pop     BX                       ;3-18-95vw
     pop     AX                       ;3-18-95vw

     popf                             ;Restore status and

                        EXHIBIT 5-8
```

(B) ... predicting future changes in said temperature

Prediction based on trends

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b              ;Force downward
        cmp     al,7                      ;Already at max?
        je      NotTR_OSC                 ;yep, leave alone
        inc     al                        ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                      ;Max  available
        sub     ah,al                     ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotSig2                   ;Not zero
        inc     ah                        ;Look at every minute
NotSig2:shl     ah,3                        ;Align the time constant
        or      ah,bh                     ;Align the direction
        or      ah,al                     ;Align the TRange
        mov     bl,al                     ;TRange
        mov     bh,0                      ;Upper index.
;
```

EXHIBIT I-3

(B) ... predicting future changes in said temperature

Predicting future changes
By studying trend to be downward,
Upward, stable, or oscillating.

Implementation functional
For prototype and patent purposes
By 9/15/1994

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

(M) a **clock manager ...**

The Temperature Controller

The Clock Manager – receives control signal from temperature controller

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.

     call    UpdateTemperature          ;Do it
     mov     al,3ah
     call    CmosRead                   ;Read Temperature byte
     mov     al,ah                      ;Direction/Time/Level
     and     ah,38h                     ;Just the time and level
please
     mov     bh,al                      ;Get the direction
     and     al,7                       ;Level computed for Temp
range
     and     bh,11000000b               ;Direction

     cmp     ah,0                       ;Good read?
     jne     LeaveDownCountT            ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
     cmp     bh,11000000b               ;OSC?
     jne     NotTR_OSC                  ;Nop!
```

[redacted]

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and

a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

(Q) to receive a **control signal** ...

```
    DoKBThermalRead:

;      Try for a Thermal Management hit: return time count = 0
then
;      we had one, else we need to leave it along.

      call   UpdateTemperature        ;Do it
      mov    al,3ah
      call   CmosRead                 ;Read Temperature byte
      mov    al,ah                    ;Direction/Time/Level
      and    ah,38h                   ;Just the time and level
please
      mov    bh,al                    ;Get the direction
      and    al,7                     ;Level computed for Temp
range
      and    bh,11000000b             ;Direction

      cmp    ah,0                     ;Good read?
      jne    LeaveDownCountT          ;Nop, leave it along
;
;      This is where we do some thermal management
;      Hold ah value or reset it as needed...
;
      cmp    bh,11000000b             ;OSC?
      jne    NotTR_OSC                ;Nop!
```

[redacted]

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

(S) ... clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
     call    UpdateTemperature        ;Do it
     mov     al,3ah
     call    CmosRead                 ;Read Temperature byte
     mov     al,ah                    ;Direction/Time/Level
     and     ah,38h                   ;Just the time and level
please
     mov     bh,al                    ;Get the direction
     and     al,7                     ;Level computed for Temp
range
     and     bh,11000000b             ;Direction

     cmp     ah,0                     ;Good read?
     jne     LeaveDownCountT          ;Nop, leave it alone
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
     cmp     bh,11000000b             ;OSC?
     jne     NotTR_OSC                ;Nop!
```

Leaves clock speed the same
"A 1st clock Signal"

[redacted]

EXHIBIT I-2

EXHIBIT V-60

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

(S) ... clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

Modifies clock signal

```
;
;       Need to setup the Doze Value based on current TRange
;
        IFDEF   ???lilyp                        ;3.08.1 6-3-95?w Set Doze
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,34h                          ; index register to write
        call    ClgWrite
        ENDIF   ;???lilyp

        IFDEF   ???lilyd                        ;3.08.1 6-3-95?w Add code
        code here
        ENDIF   ;???lilyd

        pop     ax                              ; Minutes to next scan
WriteDownCount?:
        mov     al,3ah
        call    CmosWrite                       ; Write it out
LeaveDownCount?:
        pop     bx
        pop     ax
        popf                                    ;Restore Interrupts
        ret

TDozeTable:
        db      00h                             ; Disabled
        db      38h                             ; 2 sec's
        db      30h                             ; 1 sec
        db      28h                             ; 1/2 sec
        db      28h,28h,28h,28h,28h             ;4.48b  5-11-95
;       db      20h                             ; 1/4 sec
```

EXHIBIT [illegible]

```
TempRange       label   byte
DCTempRange     label   byte
        db      0ch             ;Level 0
        db      0eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1ah             ;Level 7

ACTempRange     label   byte
        db      19h             ;Level 0
        db      1bh             ;Level 1
        db      1dh             ;Level 2
        db      1fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpdateTemperature       endp
```

EXHIBIT [illegible]

[redacted]

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lilyp products, the tables changed to under them also (see 4.48b 5-11-95)

Reference Temperature

EXHIBIT V-61

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

(S) ... clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

[redacted]

EXHIBIT I-3

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b        ;Force downward
        cmp     al,7                ;Already at max?
        je      NotTR_OSC           ;yep, leave alone
        inc     al                  ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                ;Max  available
        sub     ah,al               ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBig2             ;Not zero
        inc     ah                  ;Look at every minute
NotBig2:shl     ah,3                ;Align the time constant
        or      ah,bh               ;Align the direction
        or      ah,al               ;Align the TRange
        mov     bl,al               ;TRange
        mov     bh,0                ;Upper index.
```

Tlevel sets time – based on acceptable level of temperature rise or fall (direction gives rise or fall, and TRange give temperature Low and Max in range. Acceptable rate is time and temperature based dependent on direction of trend.

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; **(B)** and a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

(S) ... clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

```
;
;       OSC, so set the temp level up by one
;
    mov     bh,00000000b            ;Force downward
    cmp     al,7                    ;Already at max?
    je      NotTR_OSC               ;yep, leave alone
    inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
    mov     ah,7                    ;Max  available
    sub     ah,al                   ;7-7 = 0 so watch it!
    cmp     ah,0
    jne     NotBig2                 ;Not zero
    inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                    ;Align the time constant
    or      ah,bh                   ;Align the direction
    or      ah,al                   ;Align the TRange
    mov     bl,al                   ;TRange
    mov     bh,0                    ;Upper index.
;
;       Need to setup the Doze Value based on current TRange
;
    push    ax
 IFDEF   zzzlilyp                        ;5.08.1 6-3-95vw Set Doze
 value
    mov     ah,byte ptr cs:TDozeTable[bx]
    mov     al,34h                  ; Index register to write
    call    CfgWrite
```

Rising faster than Acceptable rate, forces second clock signal

[redacted]

Computes Clock Signal

Receive a First or Second clock signal

76. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, (E) predicting future changes in said monitored temperature; (B) and a **clock manager** (M) adapted to receive a **control signal** (Q) from said temperature controller, said clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (S)

(S) ... clock manager reducing processing unit clock speed when one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

Rising faster than Acceptable rate, forces second clock signal

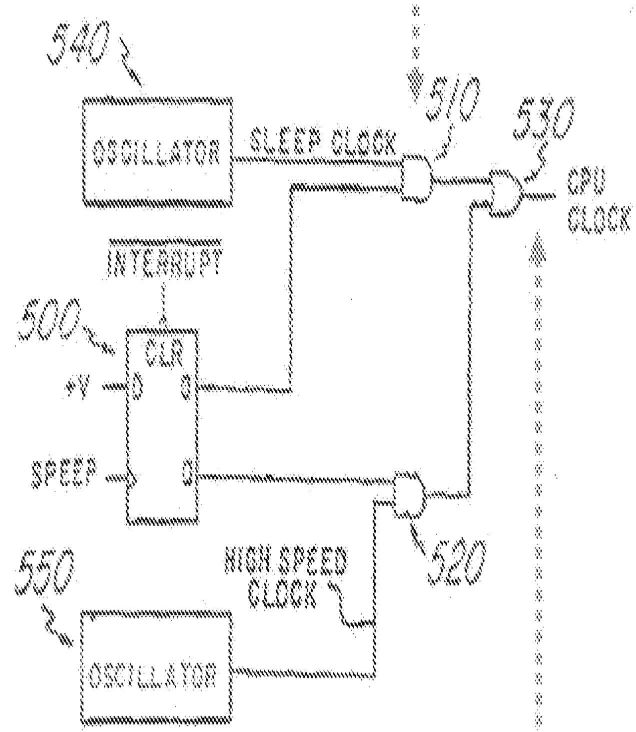



Fig.3

Computes Clock Signal

Receive a First or Second clock signal

# Claims 77, 78,79

77. (Previously presented) The apparatus of Claim 74, wherein **said processing unit is a central processing unit (CPU).** (C)

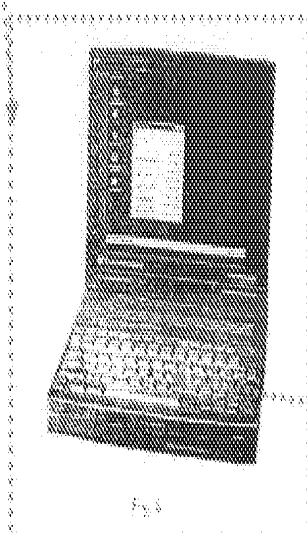
78. (Previously presented) The apparatus of Claim 75, wherein **said processing unit is a central processing unit (CPU).** (C)

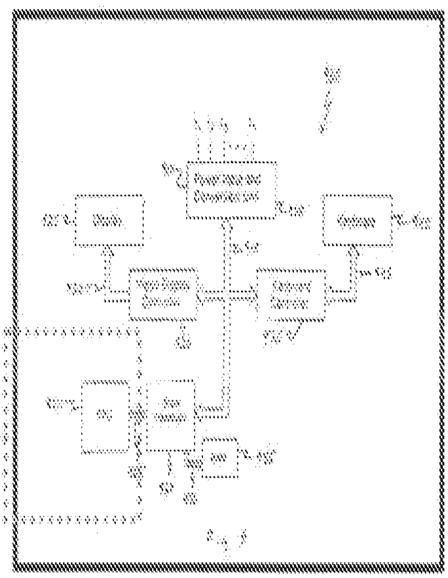
79. (Previously presented) The apparatus of Claim 76, wherein **said processing unit is a central processing unit (CPU).** (C)

(C) ... **said processing unit is a central processing unit (CPU).**

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

• An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.





# 80,81, and 82

80. (Previously presented) The apparatus of Claim 74, further comprising:
a provision for user input coupled to said processing unit, (D) and
a provision for user output coupled to said processing unit. (E)

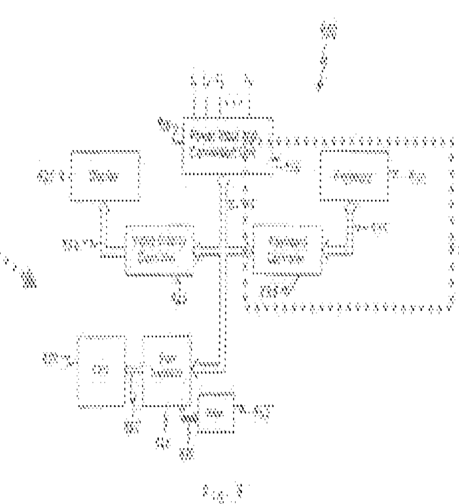
81. (Previously presented) The apparatus of Claim 75, further comprising:
a provision for user input coupled to said processing unit, (D) and
a provision for user output coupled to said processing unit. (E)

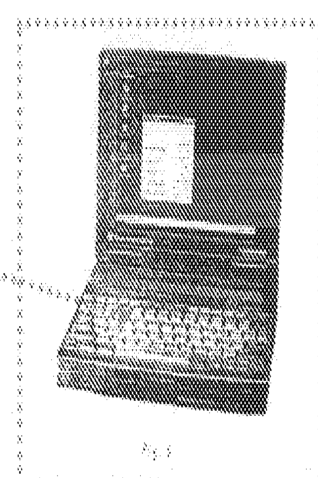
82. (Previously presented) The apparatus of Claim 76, further comprising:
a provision for user input coupled to said processing unit, (D) and
a provision for user output coupled to said processing unit. (E)

(D) ... a provision for user input coupled to said processing unit

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An internal keyboard and / or and External keyboard via the PS/2 keyboard port, see figure 8 number 940.
- An internal LCD Display and and/or External Monitor via the VGA Port, see figure 8 number 925.





80. (Previously presented) The apparatus of Claim 74, further comprising:
a provision for user input coupled to said processing unit, (D) and
a provision for user output coupled to said processing unit. (E)

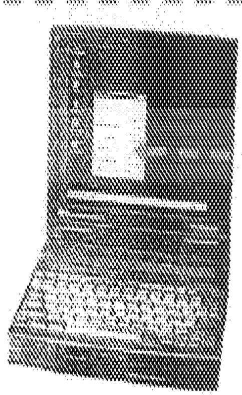
81. (Previously presented) The apparatus of Claim 75, further comprising:
a provision for user input coupled to said processing unit, (D) and
a provision for user output coupled to said processing unit. (E)

82. (Previously presented) The apparatus of Claim 76, further comprising:
a provision for user input coupled to said processing unit, (D) and
a provision for user output coupled to said processing unit. (E)

(E) ... a provision for user input coupled to said processing unit

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An internal keyboard and / or and External keyboard via the PS/2 keyboard port, see figure 8 number 940.
- An internal LCD Display and and/or External Monitor via the VGA Port, see figure 8 number 925.



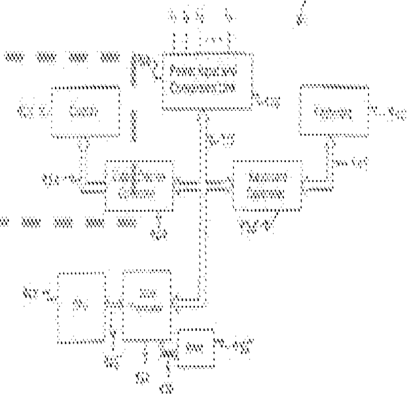


EXHIBIT V-67

# Claims 83, 84, 85

83. (Previously presented) The apparatus of Claim 74, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

84. (Previously presented) The apparatus of Claim 75, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

85. (Previously presented) The apparatus of Claim 76, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

(B) ... said clock manager further stops clock signals from being sent to a bus coupled to the processing unit.

```
or      byte ptr es:busy_forms.BUSY_FLAG
cli
push    cx              ; Save loop counter
mov     cl,03h          ; PCI bus clock divider to set
call    PCICONFIG       ; Set it; cx = old value to reset
mov     al,2eh
out     0f2h,al
in      al,0f3h         ; Get value
push    ax              ; Save the mother load
and     al,01111111b
```

TI-20567 Page 39

Set Value on PCI Bus that is Coupled to CPU Bus

```
or      al,00_100B

out     0f3h,al         ; stop clock
jmp     $+2
jmp     $+2
pop     ax
out     0f3h,al
;;; let it flow back to original    mov     cl,[illegible]
    mov             cl,[illegible]
;;; set it to 00 or 33 bz          mov     cl,01h
    call    PCICONFIG       ; Reset PCI bus to old value

    pop     cx              ; Reset counter for loop count
;;      sti
    sti
    [illegible]

    inc     [illegible]
    loop    CheckAllDevices         ; Give it another shot if requested
    and     byte ptr es:busy_forms,NOT_BUSY_FLAG

    ret
force_sleep     endp
include ..\[illegible].asm
```

TI-20567 Page 40

STOP CLOCK on ALL BUS(S) Coupled to CPU Bus and CPU

83. (Previously presented) The apparatus of Claim 74, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

84. (Previously presented) The apparatus of Claim 75, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

85. (Previously presented) The apparatus of Claim 76, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

(B) ... said clock manager further stops clock signals from being sent to a bus coupled to the processing unit.

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

• An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.

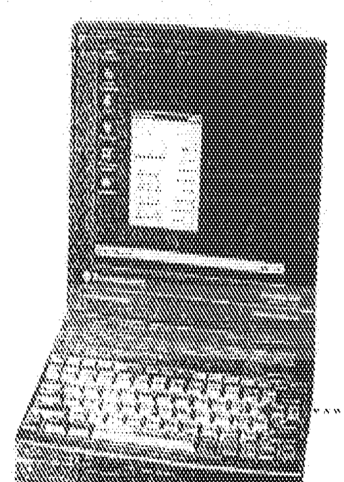


Fig. 6

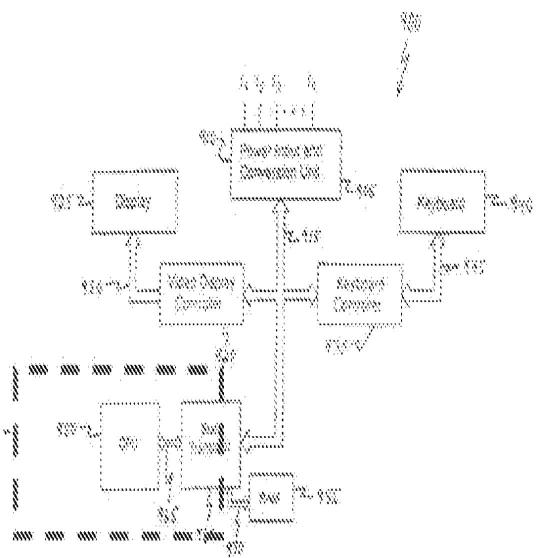



Fig. 8

EXHIBIT V-69

83. (Previously presented) The apparatus of Claim 74, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

84. (Previously presented) The apparatus of Claim 75, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

85. (Previously presented) The apparatus of Claim 76, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

(B) ... said clock manager further stops clock signals from being sent to a bus coupled to the processing unit.

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- <u>An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.</u>
- <u>An PCI Bus coupled to processor unit. see page 26</u>

The 50 Mhz bus of the CPU is connected to a VL to PCI bridge chip from ACC microelectronics to generate the PCI bus. The bridge chip takes a 33.333 Mhz oscillator to make the PCI bus clock. The Cirrus Logic GD7542 video controller is driven from this bus and this bus has an external connector for future docking options.

The GD542 video controller has a 14.318 Mhz oscillator input which it uses internally to synthesize the higher video frequencies necessary to drive an internal 10.4" TFT panel or external CRT monitors. When running in VGA resolution modes the TFT panel may be operated at the same time as the external analog monitor. For Super VGA resolutions only the external CRT may be used.

83. (Previously presented) The apparatus of Claim 74, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

84. (Previously presented) The apparatus of Claim 75, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

85. (Previously presented) The apparatus of Claim 76, wherein said clock manager further stops clock signals from being sent to a bus coupled to the processing unit. (B)

(B) ... said clock manager further stops clock signals from being sent to a bus coupled to the processing unit.

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An PCI Bus coupled to processor unit, see page 26
- An PCI Bus coupled to processor unit, is initialized via code page 43.

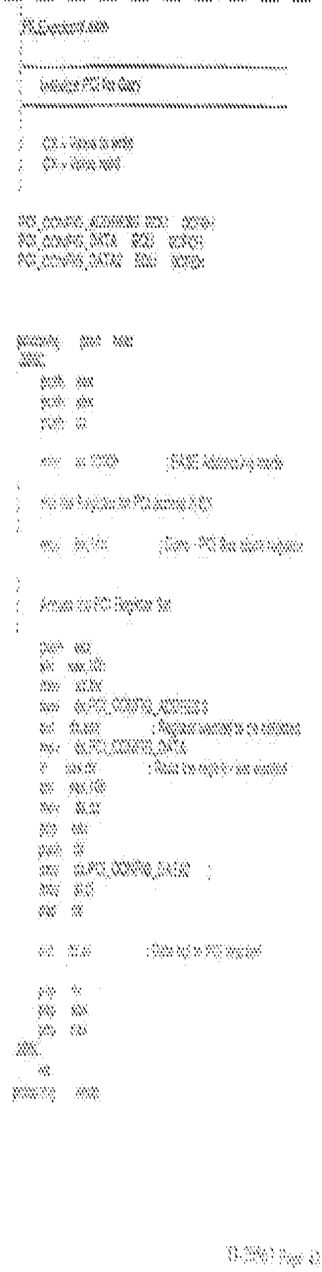


EXHIBIT V-71

# Claims 86, 87, 88

86. (Previously presented) The apparatus of Claim 83, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

87. (Previously presented) The apparatus of Claim 84, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

88. (Previously presented) The apparatus of Claim 85, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

**(B) ... said clock manager further stops clock signals from being sent to any other processors connected to the bus**

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- <u>An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.</u>

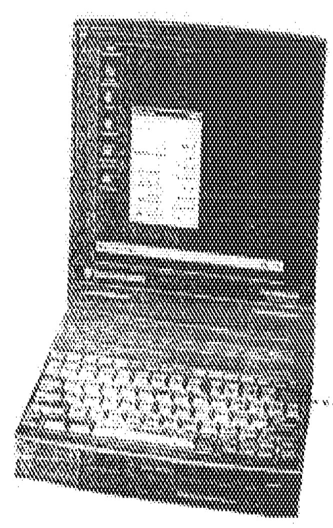


Fig. 6

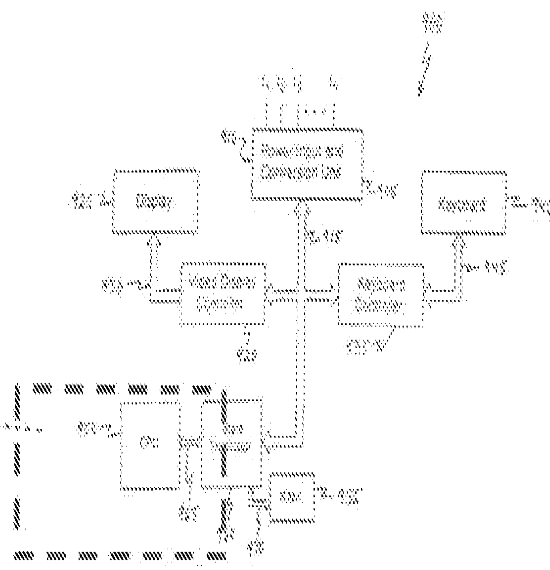



Fig. 8

EXHIBIT V-72

86. (Previously presented) The apparatus of Claim 83, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

87. (Previously presented) The apparatus of Claim 84, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

88. (Previously presented) The apparatus of Claim 85, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

**(B) ... said clock manager further stops clock signals from being sent to any other processors connected to the bus**

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- Multiple processors were present within the prototype as represented by Figure 7.

Processors intended to have clocks stopped are connected to PCI clock/bus (33MHz) and CPU clock (50MHz) oscillators.
- Pentium
- PCMICA Controller
- Any processors located on 140 pin expansion connector (docked)

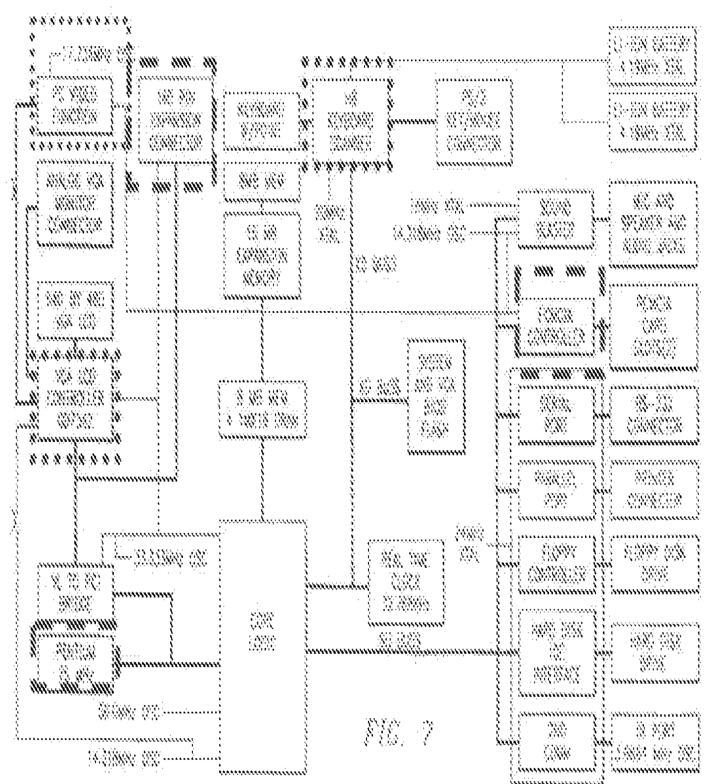


FIG. 7

Processors **NOT intended** to have clocks stopped have another clock oscillator input other than the PCI clock/bus (33MHz) and CPU clock (50MHz) oscillators.
- VGA LCD Controller (14MHz OSC)
- PC Video functions(17MHz OSC)
- Keyboard scanner (20MHz XTAL)
- Sound Blaster(14MHz OSC, 16MHz XTAL)
- Devices such as Floppy controllers, etc that have the 24MHz XTAL.

86. (Previously presented) The apparatus of Claim 83, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

87. (Previously presented) The apparatus of Claim 84, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

88. (Previously presented) The apparatus of Claim 85, wherein said clock manager further stops clock signals from being sent to any other processors connected to the bus. (B)

**(B) ... said clock manager further stops clock signals from being sent to any other processors connected to the bus**

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- Multiple processors were present within the prototype as represented by Figure 7.

Set Value on PCI Bus that is Coupled to CPU Bus

```
or      byte ptr cs:busy_force,BUSY_FLAG
cli
push    ax              ; Save loop counter
mov     al,02h          ; PCI bus clock divider to set
call    PCICONFIG       ; Set it; ax = old value to reset
mov     al,[illegible]
out     [illegible],al
in      al,[illegible]  ; Get value
push    ax              ; Save the mother load
and     al,01111111b
```

TI-20567 Page 39

```
[illegible]
out     [illegible],al  ; stop clock
jmp     $+2
jmp     $+2
pop     ax
out     [illegible],al
;;; Set it clock back to original
[illegible]
        call    PCICONFIG       ; Reset PCI bus to old value
        pop     cx              ; Reset counter for loop count
[illegible]
        inc     [illegible]
        loop    [illegible]     ; Give it another shot if requested
        and     byte ptr cs:busy_force,NOT_BUSY_FLAG
        ret
[illegible]
```

TI-20567 Page 40

Processors intended to have clocks stopped are connected to PCI clock/bus (33MHz) and CPU clock (50MHz) oscillators.
- Pentium
- PCMICA Controller
- Any processors located on 140 pin expansion connector (docked)

STOP CLOCK on ALL BUS(S) Coupled to CPU Bus and CPU

# Claims 89,90, 91

89. (Previously presented) The apparatus of Claim 74, wherein said temperature controller is on board said processing unit. (D)

90. (Previously presented) The apparatus of Claim 75, wherein said temperature controller is on board said processing unit. (D)

91. (Previously presented) The apparatus of Claim 76, wherein said temperature controller is on board said processing unit. (D)

92. (Previously presented) The apparatus of Claim 74, wherein said monitored temperature is detected via a temperature sensor coupled to said processing unit.

(D) ... said temperature controller is on board said processing unit

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- <u>An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.</u>
- <u>An internal Keyboard Controller</u> that contained the logic and A/D converter and transmit the information to the CPU to control the temperature, see figure 8 number 940.

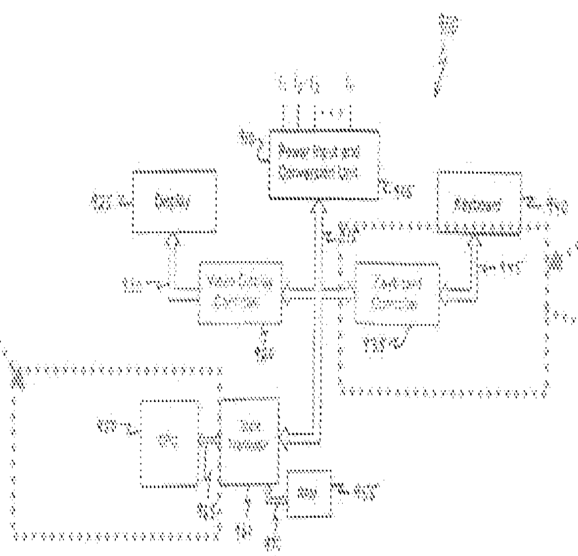



Fig. 8

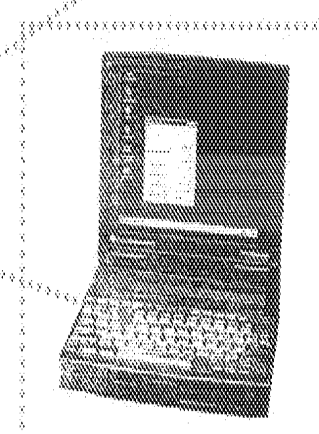


Fig. 6

EXHIBIT V-75

89. (Previously presented) The apparatus of Claim 74, wherein said temperature controller is on board said processing unit. (D)

90. (Previously presented) The apparatus of Claim 75, wherein said temperature controller is on board said processing unit. (D)

91. (Previously presented) The apparatus of Claim 76, wherein said temperature controller is on board said processing unit. (D)

92. (Previously presented) The apparatus of Claim 74, wherein said monitored temperature is detected via a temperature sensor coupled to said processing unit.

(D) ... said temperature controller is on board said processing unit

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An internal Keyboard Controller that contained the logic and A/D converter and transmit the information to the CPU to control the temperature, see figure 8 number 940.

The "Do Thermal Management" loop first goes and gets the CPU relevant temperature, then it computes the direction of the temperature, puts up the tick counts for later usage (e.g. how many times you need to slice to bring down the temperature). Getting the temperature is relatively simple, the system goes out and reads the value from a keyboard controller, from an A/D converter, etc. If an A/D converter is used, the equations in the program convert an A/D value over to some value of temperature based on a gradient, which is a little different for every system. Theoretically, you can normalize the gradient for any system if there are enough characterizations. As an example, in the program, the temperature of a Toshiba Case is measured against the temperature of the present system to compare the difference (37 degrees celsius versus the 37.25 degree celsius reading of the present system - as a result, any system can be benchmarked other systems in order to normalize the temperature gradient). Each of the zones has a corresponding temperature range. There are a series of tables in the program for computations that select the number of ticks are to be used to sleep the processor. An advantage of this embodiment of the invention is that it facilitates predictions of temperature zones when the temperature is increasing, decreasing, oscillating or stable. This facilitates table action or implements additional action by the system. The feed back loop in this embodiment has more

TI-20567 Page 20

# Claims and 92, 93, 94

92. (Previously presented) The apparatus of Claim 74, wherein said monitored temperature is detected via a temperature sensor coupled to said processing unit. (D)

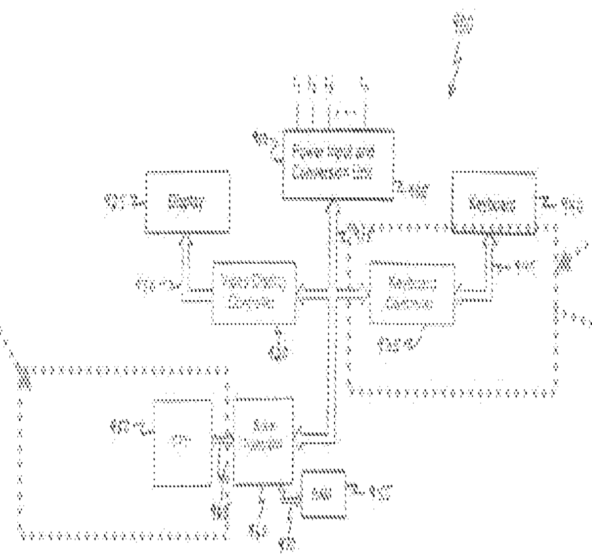
93. (Previously presented) The apparatus of Claim 75, wherein said monitored temperature is detected via a temperature sensor coupled to said processing unit. (D)

94. (Previously presented) The apparatus of Claim 76, wherein said monitored temperature is detected via a temperature sensor coupled to said processing unit. (D)

(D) ... **said monitored temperature is detected via a temperature sensor coupled to said processing unit.**

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An internal Keyboard Controller that contained the logic and A/D converter and transmit the information to the CPU to control the temperature, see figure 8 number 940.



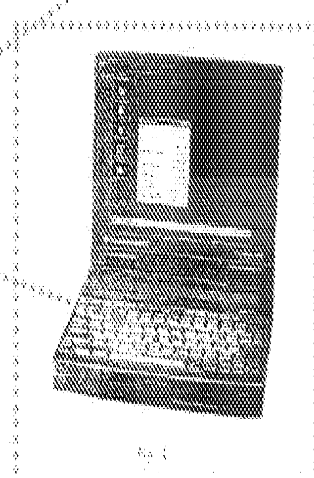


Fig. 8

EXHIBIT V-77

92. (Previously presented) The apparatus of Claim 74, wherein said monitored temperature is detected via a temperature sensor coupled to said processing unit. (D)

93. (Previously presented) The apparatus of Claim 75, wherein said monitored temperature is detected via a temperature sensor coupled to said processing unit. (D)

94. (Previously presented) The apparatus of Claim 76, wherein said monitored temperature is detected via a temperature sensor coupled to said processing unit. (D)

(D) ... **said monitored temperature is detected via a temperature sensor coupled to said processing unit.**

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An internal Keyboard Controller that contained the logic and A/D converter and transmit the information to the CPU to control the temperature, see figure 8 number 940.

The "Do Thermal Management" loop first goes and gets the CPU relevant temperature, then it computes the direction of the temperature, puts up the tick counts for later usage (e.g. how many times you need to slice to bring down the temperature). Getting the temperature is relatively simple, the system goes out and reads the value from a keyboard controller, from an A/D converter, etc. If an A/D converter is used, the equations in the program convert an A/D value over to some value of temperature based on a gradient, which is a little different for every system. Theoretically, you can normalize the gradient for any system if there are enough characterizations. As an example, in the program, the temperature of a Toshiba Case is measured against the temperature of the present system to compare the difference (37 degrees celsius versus the 37.25 degree celsius reading of the present system - as a result, any system can be benchmarked other systems in order to normalize the temperature gradient). Each of the zones has a corresponding temperature range. There are a series of tables in the program for computations that select the number of ticks are to be used to sleep the processor. An advantage of this embodiment of the invention is that it facilitates predictions of temperature zones when the temperature is increasing, decreasing, oscillating or stable. This facilitates table action or implements additional action by the system. The feed back loop in this embodiment has more

TI-20567 Page 20

# Claims 95, 96, 97.

95. (Previously presented) The apparatus of Claim 74, wherein said temperature sensor is mounted within said processing unit. (D)

96. (Previously presented) The apparatus of Claim 75, wherein said temperature sensor is mounted within said processing unit. (D)

97. (Previously presented) The apparatus of Claim 76, wherein said temperature sensor is mounted within said processing unit. (D)

**(D) ... said temperature sensor is mounted within said processing unit**

This was a technology limitation at the time since it was quicker and less expensive to use an CPU that was commercially available at the time and place the temperature sensor adjacent to the CPU rather than built a CPU with the temperature sensor within it. However, for mass production, placing the temperature sensor within the processing unit would have been more cost effective and would have been the selected choice if the technology limitation at the time was removed.

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An internal Keyboard Controller that contained the logic and A/D converter and transmit the information to the CPU to control the temperature, see figure 8 number 940.

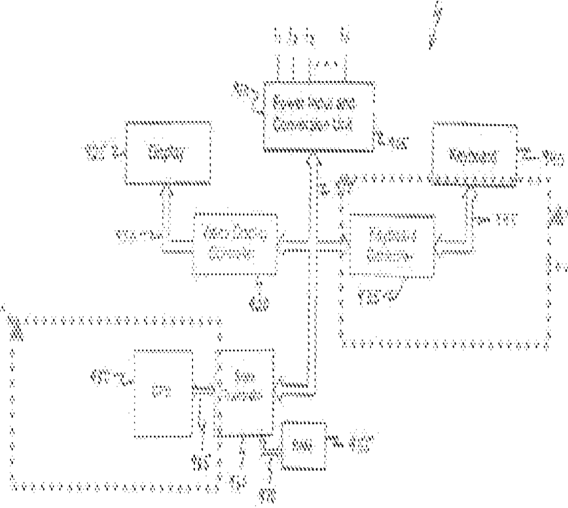


Fig. 8

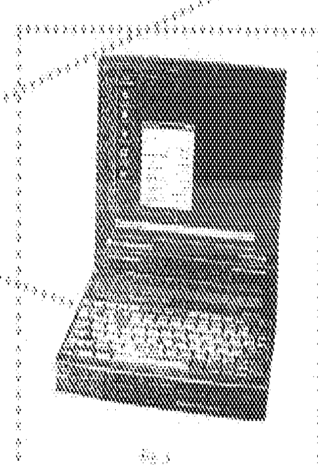


EXHIBIT V-79

95. (Previously presented) The apparatus of Claim 74, wherein said temperature sensor is mounted within said processing unit. (D)

96. (Previously presented) The apparatus of Claim 75, wherein said temperature sensor is mounted within said processing unit. (D)

97. (Previously presented) The apparatus of Claim 76, wherein said temperature sensor is mounted within said processing unit. (D)

This was a technology limitation at the time since it was quicker and less expensive to use an CPU that was commercially available at the time and place the temperature sensor adjacent to the CPU rather than built a CPU with the temperature sensor within it. However, for mass production, placing the temperature sensor within the processing unit would have been more cost effective and would have been the selected choice if the technology limitation at the time was removed.

(D) ... **said monitored temperature is detected via a temperature sensor coupled to said processing unit.**

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used
- <u>An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.</u>
- <u>An internal Keyboard Controller</u> that contained the logic and A/D converter and transmit the information to the CPU to control the temperature, see figure 8 number 940.

The "Do Thermal Management" loop first goes and gets the CPU relevant temperature, then it computes the direction of the temperature, puts up the tick counts for later usage (e.g. how many times you need to slice to bring down the temperature). Getting the temperature is relatively simple, the system goes out and reads the value from a keyboard controller, from an A/D converter, etc. If an A/D converter is used, the equations in the program convert an A/D value over to some value of temperature based on a gradient, which is a little different for every system. Theoretically, you can normalize the gradient for any system if there are enough characterizations. As an example, in the program, the temperature of a Toshiba Case is measured against the temperature of the present system to compare the difference (37 degrees celsius verses the 37.25 degree celsius reading of the present system - as a result, any system can be benchmarked other systems in order to normalize the temperature gradient). Each of the zones has a corresponding temperature range. There are a series of tables in the program for computations that select the number of ticks are to be used to sleep the processor. An advantage of this embodiment of the invention is that it facilitates predictions of temperature zones when the temperature is increasing, decreasing, oscillating or stable. This facilitates table action or implements additional action by the system. The feed back loop in this embodiment has more

# Claims 98, 99, and 100

98. (Previously Presented) The apparatus of Claim 74, wherein said temperature sensor is mounted on a printed circuit board adjacent said processing unit. (D)

99. (Previously Presented) The apparatus of Claim 75, wherein said temperature sensor is mounted on a printed circuit board adjacent said processing unit. (D)

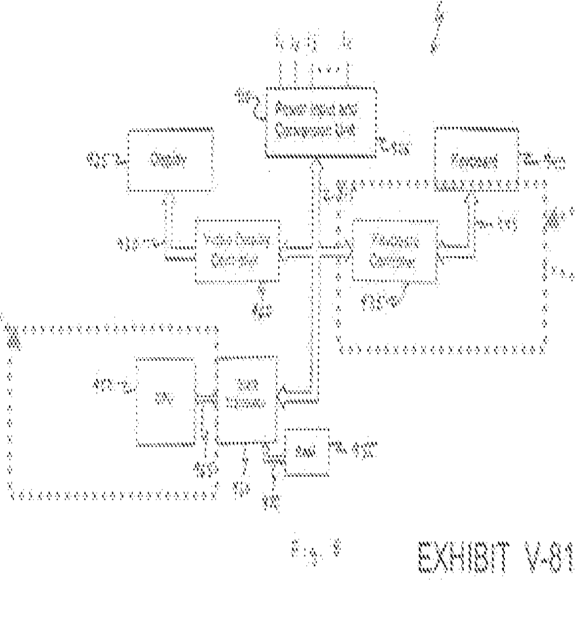
100. (Previously Presented) The apparatus of Claim 76, wherein said temperature sensor is mounted on a printed circuit board adjacent said processing unit. (D)

(D) ... **said temperature sensor is mounted adjacent said processing unit.**

This was a technology limitation at the time since it was quicker and less expensive to use an CPU that was commercially available at the time and **place the temperature sensor adjacent to the CPU** rather than built a CPU with the temperature sensor within it. However, for mass production, placing the temperature sensor within the processing unit would have been more cost effective and would have been the selected choice if the technology limitation at the time was removed.

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An internal Keyboard Controller that contained the logic and A/D converter and transmit the information to the CPU to control the temperature, see figure 8 number 940.



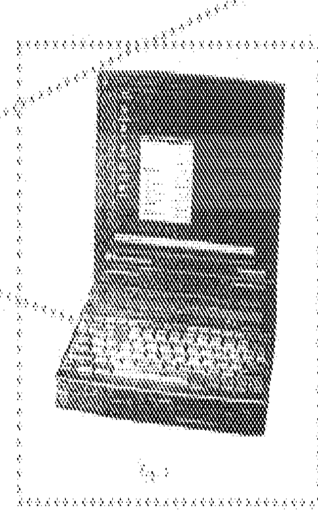



Fig. 8 EXHIBIT V-81

98. (Previously Presented) The apparatus of Claim 74, wherein said temperature sensor is mounted on a printed circuit board adjacent said processing unit. (D)

99. (Previously Presented) The apparatus of Claim 75, wherein said temperature sensor is mounted on a printed circuit board adjacent said processing unit. (D)

100. (Previously Presented) The apparatus of Claim 76, wherein said temperature sensor is mounted on a printed circuit board adjacent said processing unit. (D)

This was a technology limitation at the time since it was quicker and less expensive to use an CPU that was commercially available at the time and **place the temperature sensor adjacent to the CPU** rather than built a CPU with the temperature sensor within it. However, for mass production, placing the temperature sensor within the processing unit would have been more cost effective and would have been the selected choice if the technology limitation at the time was removed.

(D) ... **said temperature sensor is mounted adjacent said processing unit.**

These claims are support by the fact the prototype (Page 26 line 6 to 12, Figure 6 is the representation of the prototype model) used for heat and power testing was completed by 9/15/1994 and the prototype used

- An Intel CPU (Central Processing Unit) see figure 8 number 950, figure 5 page 25 lines 7 to line 10.
- An internal Keyboard Controller that contained the logic and A/D converter and transmit the information to the CPU to control the temperature, see figure 8 number 940.

The "Do Thermal Management" loop first goes and gets the CPU relevant temperature; then it computes the direction of the temperature, puts up the tick counts for later usage (e.g. how many times you need to slice to bring down the temperature). Getting the temperature is relatively simple, the system goes out and reads the value from a keyboard controller, from an A/D converter, etc. If an A/D converter is used, the equations in the program convert an A/D value over to some value of temperature based on a gradient, which is a little different for every system. Theoretically, you can normalize the gradient for any system if there are enough characterizations. As an example, in the program, the temperature of a Toshiba Case is measured against the temperature of the present system to compare the difference (37 degrees celsius versus the 37.25 degree celsius reading of the present system - as a result, any system can be benchmarked other systems in order to normalize the temperature gradient). Each of the zones has a corresponding temperature range. There are a series of tables in the program for computations that select the number of ticks are to be used to sleep the processor. An advantage of this embodiment of the invention is that it facilitates predictions of temperature zones when the temperature is increasing, decreasing, oscillating or stable. This facilitates table action or implements additional action by the system. The feed back loop in this embodiment has more



EXHIBIT V-82

# Claims 101, 102, and 103

101.(Previously presented) The apparatus of Claim 74, herein said temperature is sensed on a periodic basis. (A)

102. (Previously presented) The apparatus of Claim 75, wherein said temperature is sensed on a periodic basis. (A)

103. (Previously presented) The apparatus of Claim 76, wherein said temperature is sensed on a periodic basis. (A)

(A) ... said temperature is sensed on a periodic basis.

A sample, on periodic basis

Down counts period to sample
For next pass, when bit hits 08h
Then on next pass period will expire
And sample of temperature will occur

```
    cmp     al,08h                  ;Time to read data from KB?
    je      DoKBThermalRead
    [illegible]
    dec     al
    and     ah,NOT 38h              ;Keep theold stuff
    shl     al,3
    or      ah,al                   ;New value
    jmp     WriteDownCountT

DoKBThermalRead:
;
;       Try for a Thermal Management Hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
    call    UpdateTemperature       ;Do it
    mov     al,1Ah
    call    CmosRead                ;Read Temperature byte
    mov     al,ah                   ;Direction/Time/Level
    and     ah,38h                  ;Just the time and level
please
    mov     bh,al                   ;Get the direction
    and     al,7                    ;Level computed for Temp
range
    and     bh,11000000b            ;Direction

    cmp     ah,0                    ;Good read?
    jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b            ;OSC?
    jne     NotIR_OSC               ;Nop!
```

Temperatures and control signals are returned in CMOS storage area that is read by CMOSRead program

EXHIBIT I-2

EXHIBIT V-83

[redacted]

# Claims 104, 105, and 106

104. (Previously presented) The apparatus of Claim 101, wherein the frequency of said temperature sensing changes as said temperature reaches preselected threshold values. (A)

105. (Previously presented) The apparatus of Claim 102, wherein the frequency of said temperature sensing changes as said temperature reaches preselected threshold values. (A)

106. (Previously presented) The apparatus of Claim 103, wherein the frequency of said temperature sensing changes as said temperature reaches preselected threshold values. (A)

**(A) ... the frequency of said temperature sensing changes as said temperature reaches preselected threshold values.**

EXHIBIT I-3

[illegible]

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
;       Need to setup the Doze Value based on current TRange
;
        push    ax
IFDEF   zzzlilyp                        ;5.08.1 6-3-95vw Set Doze
Value
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,54h                  ; Index register to write
        call    CfgWrite
```

Sample period time based on Temperature Level

EXHIBIT V-84

104. (Previously presented) The apparatus of Claim 101, wherein the frequency of said temperature sensing changes as said temperature reaches preselected threshold values. (A)

105. (Previously presented) The apparatus of Claim 102, wherein the frequency of said temperature sensing changes as said temperature reaches preselected threshold values. (A)

106. (Previously presented) The apparatus of Claim 103, wherein the frequency of said temperature sensing changes as said temperature reaches preselected threshold values. (A)

(A) ... **the frequency of said temperature sensing changes as said** temperature reaches preselected threshold values.

Modifies clock signal changing frequency of sensing temperature – how quickly or long it is between samples.

Pre-selected threshold values

```
;
;      Need to setup the Doze Value based on current TRange
;

IFDEF  xxxlilyp                         ;5.08.1 6-3-95cw Set Doze
    mov    al,byte ptr cs:TDozeTable(bx)
    mov    bl,34h                       ; Index register to write
    call   CfgWrite
ENDIF  ;xxxlilyp

IFDEF  xxxlilyd                         ;5.08.1 6-3-95cw Add doze
code here
ENDIF  ;xxxlilyd

    pop    ax                           ; Minutes to next scan
WriteDownCount?:
    mov    bl,36h
    Call   CmosWrite                    ; Write it out
LeaveDownCount?:
    pop    cx
    pop    ax
    popf                                ;Restore Interrupts
    ret

TDozeTable:
    db     00h                          ; Disabled
    db     38h                          ; 2 secs
    db     30h                          ; 1 sec
    db     28h                          ; 1/2 sec
    db     28h,28h,28h,28h,28h          ;4.48b  5-11-95
;       db      20h                         ; 1/4 sec
```

EXHIBIT 1-3

```
TempRange          label    byte
DCTempRange        label    byte
           db       0ch              ;Level 0
           db       0eh              ;Level 1
           db       10h              ;Level 2
           db       12h              ;Level 3
           db       14h              ;Level 4
           db       16h              ;Level 5
           db       18h              ;Level 6
           db       1ah              ;Level 7

ACTempRange        label    byte
           db       19h              ;Level 0
           db       1bh              ;Level 1
           db       1dh              ;Level 2
           db       1fh              ;Level 3
           db       21h              ;Level 4
           db       23h              ;Level 5
           db       25h              ;Level 6
           db       27h              ;Level 7

UpdateTemperature   endp
```

EXHIBIT 1-3

[redacted]

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lillyp products, the tables changed to under them also (see 4.48b 5-11-95)

Temperature

EXHIBIT V-85

# Claims 107, 108, and 109

107. (Previously presented) The apparatus of Claim 101, wherein the frequency of said temperature sensing is user modifiable. (D)

108. (Previously presented) The apparatus of Claim 102, wherein the frequency of said temperature sensing is user modifiable. (D)

109. (Previously presented) The apparatus of Claim 103, wherein the frequency of said temperature sensing is user modifiable. (D)

Auto/on/off set by user in SETUP

Implementation functional
For prototype and patent purposes
By 3-24-1995

```
;
;       Smart range coded added 3-12-95vw
;       Allow user to select which range of thermal management he
wants
;       Power Saving = ON  --DC range
;                     OFF -AC range
;                    AUTO -If AC operation, using AC range
;                         -If DC operation, using DC range
;
```

(D) ... the frequency of said temperature sensing is user modifiable

EXHIBIT I-7

```
;
;     3-24-95 Added Auto/On?off selection
;
    mov     al,66h
    call    CmosRead              ;Get Auto/On/Off Selection
```

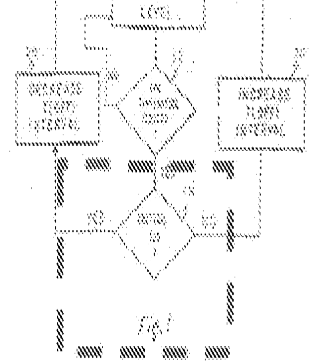
Note: this feature was added after code was converted to ROM based needed for production as an enhancement to technology in Mar 1995. Dischler did NOT provide auto selection by user.

# Claims 110

110. (Previously presented) The apparatus of Claim 74, wherein said clock manager avoids selectively stopping clock signals from being sent to said processing unit when said processing unit is processing critical I/O. (F)

(F) ... said clock manager avoids selectively stopping clock signals from being sent to said processing unit when said processing unit is processing critical I/O.

consumption is reduced from the E(max) state. In order to align the T(off) intervals with periods of CPU inactivity, the CPU activity and temperature levels are used to determine the width of the T(off) intervals in a closed loop. FIG. 1 depicts such a closed loop. The activity level of the CPU is determined at Step 10. If CPU temperature is not a concern (Step 12), the activity level of the CPU is again determined (Step 10). If CPU temperature is a concern, a determination is made (Step 14) as to whether or not critical I/O is being performed. If critical I/O is being performed, the present invention increases the T(off) interval (Step 20) and returns to determine the activity level of the CPU again. If, on the other hand, critical I/O is not being performed, the present invention decreases the T(off) interval (Step 30) and proceeds to again determine the activity level of the CPU. Thus the T(off) intervals are constantly being adjusted to match the system activity level and control the temperature level of the CPU.



. . .

# Claims 111

111. (Previously presented) The apparatus of Claim 75, wherein said processing unit receives said first clock signal while processing critical I/O irregardless of said one of: a) said monitored temperature rises to at least a selected reference temperature level, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

(F) ... said processing unit receives said first clock signal while processing critical I/O irregardless of said one of: a) said monitored temperature rises to at least a selected reference temperature level, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

period adjusts itself in response to CPU temperature. Performance taken away from the user during power conservation and thermal management control is balanced against critical I/O going on in the system.

Existing thermal management systems turn on and stay on until the CPU temperature goes down. Unfortunately, this preempts things in the system. Such is not the case in the environment of the present invention. The same sleep manager has global control. As an example, while CPU temperature may be rising or have risen to a level of concern, the system may be processing critical I/O, such as a wave file being played. With critical I/O, the system of the present invention will play the wave file without interruption even though the result may be a higher CPU temperature. CPUs do not typically overheat all at once. There is a temperature rise gradient. The system of the present invention takes advantage of the temperature rise gradient to give a user things that affect the user time slices and take it away from him when its not affected.

# Claims 112

112. (Previously presented) The apparatus of Claim 76, wherein said clock manager avoids reducing said processing unit clock speed when said processing unit is processing critical I/O. (F)

(F) ... said clock manager avoids reducing said processing unit clock speed when said processing unit is processing critical I/O.

consumption is reduced from the E(max) state. In order to align the T(off) intervals with periods of CPU inactivity, the CPU activity and temperature levels are used to determine the width of the T(off) intervals in a closed loop. FIG. 1 depicts such a closed loop. The activity level of the CPU is determined at Step 10. If CPU temperature is not a concern (Step 12), the activity level of the CPU is again determined (Step 10). If CPU temperature is a concern, a determination is made (Step 14) as to whether or not critical I/O is being performed. If critical I/O is being performed, the present invention increases the T(off) interval (Step 20) and returns to determine the activity level of the CPU again. If, on the other hand, critical I/O is not being performed, the present invention decreases the T(off) interval (Step 30) and proceeds to again determine the activity level of the CPU. Thus the T(off) intervals are constantly being adjusted to match the system activity level and control the temperature level of the CPU.

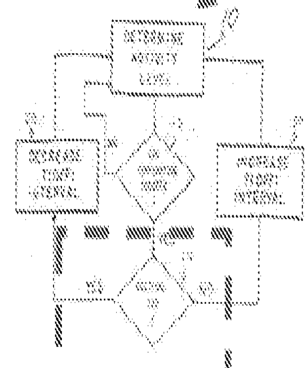


Fig. 1

. . .

# Claim 113

113. (Previously presented) The apparatus of Claim 74 wherein said clock manager selectively restores said processing unit clock speed when said monitored temperature drops to at least a selected reference temperature. (D)

(D) said clock manager selectively restores said processing unit clock speed when said monitored temperature drops to at least a selected reference temperature.

[illegible]

```
        [illegible]
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,bl                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
;       Need to setup the Doze Value based on correct TRange
;
        push    ax

        IFDEF   zzzlilyp                ;5.08.1 6-3-95vw Get Doze
        Value
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,5bh                  ; Index register to write
        call    CfgWrite
        ENDIF   ;zzzlilyp

        IFDEF   zzzlily4                ;5.08.1 6-3-95vw Add Doze
        code here
        ENDIF   ;zzzlily4

        pop     ax                      ; Minutes to next scan
WriteDownCountT:
        mov     al,3bh
        call    CmosWrite               ; Write it out
LeaveDownCountT:
        pop     bx
        pop     ax
        popf                            ;Restore interrupts
        ret

TDozeTable:
        db      00h                     ; Disabled
        db      18h                     ; 2 sec's
        db      10h                     ; 1 sec
        db      28h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4,48b  5-11-95
;       db      20h                     ; 1/4 sec
```

EXHIBIT I-3

```
TempRange       label   byte
DCTempRange     label   byte
        db      0ch             ;Level 0
        db      0eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1ah             ;Level 7

ACTempRange     label   byte
        db      19h             ;Level 0
        db      1bh             ;Level 1
        db      1dh             ;Level 2
        db      1fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpDateTemperature       endp
```

EXHIBIT I-4

TRange different for AC or Battery operation. Index of zero (0) will be for Level 0 in table, etc.

As Temperature lowers, the index is reduced until the index reached zero (0). The index within the TDozeTable indicates the clock speed to be selected. An index of zero (0) disables the second clock and restores the first clock speed.

# Claim 116

116. (Previously presented) The apparatus of Claim 75, wherein said clock manager further designates that said processing unit receives said first clock signal when said monitored temperature drops to at least a selected reference temperature. (I)

**(I) said clock manager further designates that said processing unit receives said first clock signal when said monitored temperature drops to at least a selected reference temperature**

```
        mov     ax                      ;once an every minute
NotBigTemp:     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
        ;
        ;       Need to setup the Doze Value based on current TRange
        push    ax

        IFDEF   zzzillyp                ;5.08.1 6-3-95rw Set Doze
        Value
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,54h                  ; Index register to write
        call    CfgWrite
        ENDIF   ;zzzillyp

        IFDEF   zzzillyd                ;5.08.1 6-3-95rw Add doze
        code here
        ENDIF   ;zzzillyd

        pop     ax                      ; Minutes to next scan
WriteDownCountT:
        mov     al,34h
        call    CmosWrite               ; Write it out
LeaveDownCountT:
        pop     bx
        pop     ax
        popf                            ;Restore interrupts
        ret

TDozeTable:
        db      00h                     ; Disabled
        db      38h                     ; 2 sec's
        db      30h                     ; 1 sec
        db      28h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4.48b  5-11-95
;       db      20h                     ; 1/4 sec
```

[redacted]

EXHIBIT I-3

Modifies clock signal
When bx=0, first clock signal

```
TempRange       label   byte
DCTempRange     label   byte
        db      0ch             ;Level 0
        db      0eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1ah             ;Level 7

ACTempRange     label   byte
        db      19h             ;Level 0
        db      1bh             ;Level 1
        db      1dh             ;Level 2
        db      1fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpdateTemperature       endp
```

EXHIBIT I-4

TRange different for AC or Battery operation. Index of zero (0) will be for Level 0 in table; etc.

As Temperature lowers, the index is reduced until the index reached zero (0).
The index within the TDozeTable indicates the clock speed to be selected.
An index of zero (0) disables the second clock and restores the first clock signal.

# Claim 117 and 118

117. (Previously presented) The apparatus of Claim 75, wherein said clock manager designates that said processing unit receives said first clock signal in response to detection of a critical operation, regardless if one of: a) said monitored temperature rises to at least a elected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (F)

118. (Previously presented) The apparatus of Claim 75, wherein said clock manager designates that said processing unit receives said first clock signal in response to processing of a critical operation, regardless if one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate. (F)

(F) ... said clock manager designates that said processing unit receives said first clock signal in response to processing of a critical operation, regardless if one of: a) said monitored temperature rises to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are rising at a faster than acceptable rate.

period adjusts itself in response to CPU temperature. Performance taken away from the user during power conservation and thermal management control is balanced against critical I/O going on in the system.

Existing thermal management systems turn on and stay on until the CPU temperature goes down. Unfortunately, this preempts things in the system. Such is not the case in the environment of the present invention. The same sleep manager has global control. As an example, while CPU temperature may be rising or have risen to a level of concern, the system may be processing critical I/O, such as a wave file being played. With critical I/O, the system of the present invention will play the wave file without interruption even though the result may be a higher CPU temperature. CPUs do not typically overheat all at once. There is a temperature rise gradient. The system of the present invention takes advantage of the temperature rise gradient to give a user things that affect the user time slices and take it away from him when its not affected.

# Claim 119

119. (Previously presented) The apparatus of Claim 78, wherein said clock manager raises said reduced processing unit clock speed when said monitored temperature drops to at least a selected reference temperature. (D)

(D) said clock manager further designates that said processing unit receives said first clock signal when said monitored temperature drops to at least a selected reference temperature

```
        [illegible]
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
;       Need to setup the Doze Value based on current TRange
;
        push    ax

IFDEF   zzz1llyp                        ;5.08.1 6-3-95vw Set Doze
value
        mov     ah,byte ptr cs:[TDozeTable][bx]
        mov     al,34h                  ; Index register to write
        call    CfgWrite
ENDIF   ;zzz1llyp

IFDEF   zzz1llyd                        ;5.08.1 6-3-95vw Add doze
code here
ENDIF   ;zzz1llyd

        pop     ax                      ; Minutes to next scan
WriteDownCntFF:
        mov     al,3xh
        call    CmosWrite               ; Write it out
LeaveDownCountFF:
        pop     bx
        pop     ax
        popf                            ;Restore Interrupts
        ret

TDozeTable:
        db      00h                     ; Disabled
        db      38h                     ; 2 sec's
        db      30h                     ; 1 sec
        db      28h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4.48b 5-11-95
;       db      20h                     ; 1/4 sec
```

EXHIBIT 1-3

Modifies clock signal
When bx=0, first clock signal.
As temperature lowers, the
Bx value lowers and the clock
Speed increases (raises the
Current reduced clock speed).
See TDozeTable. For example,
Bx=3 raises the reduced clock speed
Of Bx=4 or higher.

[redacted]

TRange different for AC or Battery operation. Index of zero (0) will be for Level 0 in table, etc.

As Temperature lowers, the index is reduced until the index reached zero (0). The index within the TDozeTable indicates the clock speed to be selected. An index of zero (0) disables the second clock and restores the first clock signal.

# Claim 122

122. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and **a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(T) a **temperature controller ...**

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

Leaves clock speed the same

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     al,ah                   ;Direction/Time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction

        cmp     ah,0                    ;Good read?
        jne     LeaveDownCount?         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTR_OSC               ;Nop!
```

[redacted]

EXHIBIT I-2

EXHIBIT V-94

122. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(T) a **temperature controller ...**

The Temperature Controller

EXHIBIT I-4

```
;
;       Read the Temperature on the system board controlled by
Keyboard Controller
;
;       Calling Arguments
;
;       Call    UpDateTemperature
;       ON exit, the cmos parameter will contain the correct
values
;
```

[redacted]

```
        mov     al,0d4h                 ;Output the read A/D.
        out     64h,al
  testkbc_2:
        loop    testkbc_2_Okay          ;3-30-95vw Don't hang here
        jmp     ClearBusyKeyChannel     ;3-30-95vw?Should we flush
  here?
  testkbc_2_Okay:                       ;3-30-95vw
        jmp     $+2
        in      al,54h                  ;read status port
        jmp     $+2
        jmp     $+2
        test    al,2                    ;check status of input port
```

EXHIBIT I-5

Reads Temperature for starting point

```
        in      al,50h                  ;full. then, get A/D value

        cmp     al,0ffh                 ;valid value?
        je      ClearBusyKeyChannel     ;Nop!           3-17-95vw
                ;DEBUG CODE..WAits 3-12-95vw INACTIVE
        cmp     al,00h
        je      ClearBusyKeyChannel     ;Nop!   3-17-95vw
        push    ax
        mov     ah,55h
        xchg    al,ah
```

EXHIBIT I-6

Register al contains temperature

Channels 64 was changed to 54 and 60 was changed to 50 after 9/15/94. Does not affect invention, just make product work better for multitasking operating systems. Same temperature was obtained either way. Channels 60 and 64 used for FCC and UL agency testing. Implementation was functional and complete for patent purpose by 9/15/94.

EXHIBIT V-95

122. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(T) a **temperature controller ...**

The Temperat Controller

EXHIBIT I-8

```
SetTrange:
     xchg    al,cl                    ;Al has temp back; ah=index
     mov     cx,7                     ;CX = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                    ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange               ;cx=range number found
     loop    ScanRange
FoundRange:                              ;cx=range number found
```

Temperature for starting point - Register al contains temperature

[redacted]

122. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(T) a **temperature controller** ...

```
SetTRange:
    xchg    al,cl                       ;Al has temp back; ah=index
    mov     cx,7                        ;CX = loop count

ScanRange:
    mov     bx,cx
    add     bl,ah                       ;Over index for ac or dc
    cmp     al,byte ptr cs:[TempRange+bx]
    jg      FoundRange                  ;CX=range number found
    loop    ScanRange
FoundRange:                             ;CX=range number found

    mov     al,39h                      ;Read Keyboard channel
access flag
    call    CmosRead
    mov     al,ah
    and     al,3                        ;Last Temperature range
    and     ah,0c0h                     ;Upper direction trend value
    cmp     cl,al                       ;Value of cmos read
    je      RangeStable                 ;Stable process, same range
    jg      RangeUpward                 ;New range is greater than
old one
;                                        ;Range is downward trend
    cmp     ah,10000000b                ;Lastone upward?
    je      RangeOSC                    ;Yes, found osc
    mov     ch,01h
    jmp     short   AllRange
RangeOSC:
    mov     ch,0c0h                     ;OSC flag
    jmp     short   AllRange
RangeStable:
    mov     ch,00h
    jmp     short   AllRange
RangeUpward:
    cmp     ah,01000000b                ;Last one Downward?
    je      RangeOSC                    ;Yes. Osc found
    mov     ch,10
```

```
AllRange:
    or      ch,cl                       ;Range and range temp trend
    mov     ah,cl
    mov     al,39h                      ;Note that 1 ...
Bits for status complete
    call    CmosWrite

ClearBusyKeyChannel:
    mov     ax,0003Bh                   ;Free Channel
    mov     bl,10000000b                ;Mask to write
    call    CmosWriteMask               ;Bit updated
BusyKeyChannel:
    pop     cx                          ;3-18-95vw
    pop     bx                          ;3-18-95vw
    pop     ax                          ;3-18-95vw

    popf                                ;Restore status and
```

EXHIBIT 1-8

Predicting future changes

By studying trend to be downward,

Upward, stable, or oscillating.

[redacted]

122. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and **a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(M) a **a clock manager ...**

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.

    call    UpdateTemperature           ;Do it
    mov     al,3Ah
    call    CmosRead                    ;Read Temperature byte
    mov     al,ah                       ;Direction/Time/Level
    and     ah,38h                      ;Just the time and level
please
    mov     bh,al                       ;Get the direction
    and     al,7                        ;Level computed for Temp
range
    and     bh,11000000b                ;Direction

    cmp     ah,0                        ;Good read?
    jne     LeaveDownCountT             ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
    cmp     bh,11000000b                ;OSC?
    jne     NotTR_OSC                   ;Nop!
```

Leaves clock speed the same

[redacted]

EXHIBIT I-2

EXHIBIT V-98

122. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and **a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(U) ... said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate.

[redacted]

```
;
;       OSC, so set the temp level up by one
;
     mov      bh,00000060b             ;Force downward
     cmp      al,7                     ;Already at max?
     je       NotTR_OSC                ;yep, leave alone
     inc      al                       ;force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
     mov      ah,7                     ;Max  available
     sub      ah,al                    ;7-7 = 0 so watch it!
     cmp      ah,0
     jne      NotBigZ                  ;Not zero
     inc      ah                       ;Look at every minute
NotBigZ:shl      ah,3                     ;Align the time constant
     or       ah,bh                    ;Align the direction
     or       ah,al                    ;Align the TRange
     mov      bl,al                    ;TRange
     mov      bh,0                     ;Upper index.
;
;       Need to setup the Doze Value based on current TRange
;
     push     ax

IFDEF    zzzlilyp                          ;5.08.1 6-3-95vw Set Doze
value
     mov      ah,byte ptr cs:TDozeTable[bx]
     mov      al,54h                   ; Index register to write
     call     CfgWrite
```

Rising or Lowering at Acceptable rate, if index goes down, clock speed goes up-Clock frequency increases. Direction will indicate downward trend.

Computes Clock Speed

Receive clock speed to set for processor (CPU)

122. (Previously presented) An apparatus, comprising:

a <u>temperature controller</u> (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

<u>a clock manager</u> (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(U) ... said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate.

Modifies clock speed, clock frequency

```
;
;       Used to setup the Doze Value based on current TRange
;
        push    bx

IFDEF   zzlilyp                         ;5.08.1 6-3-95cw Set Doze
value
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,54h                  ; index register to write
        call    CfgWrite
ENDIF   ;zzlilyp

IFDEF   zzlilyd                         ;5.08.1 6-3-95cw add doze
code here
ENDIF   ;zzlilyd

        pop     ax                      ; Minutes to next step
WriteDownCountT:
        mov     al,38h
        call    ChcWrite                ; Write it out
LeaveDownCountT:
        pop     bx
        pop     ax
        popf                            ;Restore Interrupts
        ret

TDozeTable:
        db      00h                     ; Disabled
        db      38h                     ; 2 sec's
        db      30h                     ; 1 sec
        db      28h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4.48b  5-11-95
;       db      28h                     ; 1/4 sec
```

EXHIBIT X-3

```
TempRange       label   byte
DCTempRange     label   byte
        db      0Ch             ;Level 0
        db      0Eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1Ah             ;Level 7

ACTempRange     label   byte
        db      19h             ;Level 0
        db      1Bh             ;Level 1
        db      1Dh             ;Level 2
        db      1Fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpDateTemperature       endp
```

EXHIBIT X-9

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lillyp products, the tables changed to under them also (see 4.48b 5-11-95)

Reference Temperature

EXHIBIT V-100

122. (Previously presented) An apparatus, comprising:

a <u>temperature controller</u> (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

<u>a clock manager</u> (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(U) ... said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate.

[redacted]

EXHIBIT I-3

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
```

Tlevel sets time – based on acceptable level of temperature rise or fall (direction gives rise or fall, and TRange give temperature Low and Max in range. Acceptable rate is time and temperature based dependent on direction of trend.

EXHIBIT V-101

122. (Previously presented) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature within said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate. (U)

(U) ... said clock manager selectively raising the frequency of clock signals being sent to a processing unit when one of: a) said monitored temperature drops to at least a selected reference temperature, and b) said predicted changes in said monitored temperature are at an acceptable rate.

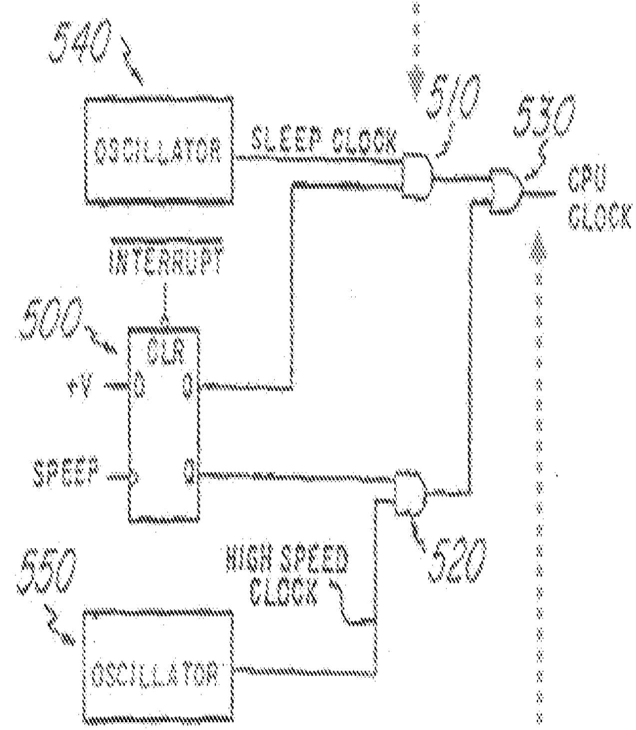



Fig. 3

Rising faster than Acceptable rate, forces second clock signal

[redacted]

Computes Clock Signal

Receive a First or Second clock signal

# Claim 123

123. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(T) a **temperature controller ...**

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

```
DoX8ThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
        call    UpdateTemperature           ;Do it
        mov     al,3ah
        call    CmosRead                    ;Read Temperature byte
        mov     al,ah                       ;Direction/Time/Level
        and     ah,38h                      ;Just the time and level
please
        mov     bh,al                       ;Get the direction
        and     al,7                        ;Level computed for Temp
range
        and     bh,11000000b                ;Direction

        cmp     ah,0                        ;Good read?
        jne     LeaveDownCountT             ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b                ;OSC?
        jne     NotTR_OSC                   ;Nop!
```

Leaves clock speed the same

[redacted]

EXHIBIT I-2

EXHIBIT V-103

123. (New) An apparatus, comprising:

a <u>**temperature controller**</u> (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

<u>**a clock manager**</u> (M) adapted to receive a control signal from said temperature controller, said clock manager selectively <u>stopping clock signals from being sent to a processing unit</u> when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(T) a <u>**temperature controller ...**</u>

The Temperature Controller

EXHIBIT I-4

```
;
;       Read the Temperature on the system board controlled by
Keyboard Controller
;
;       Calling Arguments
;
;       Call    UpDateTemperature
;       ON exit, the cmos parameter will contain the correct
values
;
```

[redacted]

```
        mov     al,0c4h                 ;Output the read A/D.
        out     64h,al
  testKbc_2:
        loop    testKbc_2_Okay          ;3-30-95vw Don't hang here
        jmp     ClearBusyKeyChannel     ;3-30-95vw?Should we (lose
  here?
  testKbc_2_Okay:                        ;3-30-95vw
        jmp     $+2
        in      al,64h                  ;read status port
        jmp     $+2
        jmp     $+2
        test    al,2                    ;check status of input port
```

EXHIBIT I-5

```
        in      al,60h                  ;full, then, get A/D value

        cmp     al,0ffh                 ;valid value?
        je      ClearBusyKeyChannel     ;Nop!           3-17-95vw
                 ;DEBUG CODE..WAtts 3-12-95vw INACTIVE
        cmp     al,00h
        je      ClearBusyKeyChannel     ;Nop!  3-17-95vw
        push    ax
        mov     ah,55h
        xchg    al,ah
```

EXHIBIT I-6

Reads Temperature for starting point

Register al contains temperature

Channels 64 was changed to 54 and 60 was changed to 50 after 9/15/94. Does not affect invention, just make product work better for multitasking operating systems. Same temperature was obtained either way. Channels 60 and 64 used for FCC and UL agency testing. Implementation was functional and complete for patent purpose by 9/15/94.

123. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively <u>stopping clock signals from being sent to a processing unit</u> when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(T) a **temperature controller ...**

The Temperatu
Controller

EXHIBIT I-8

```
SetTrange:
    xchg    al,cl                  ;Al has temp back; ah=index
    mov     cx,7                   ;cx = loop count

ScanRange:
    mov     bx,cx
    add     bl,ah                  ;Over index for ac or dc
    cmp     al,byte ptr cs:[TempRange+bx]
    jg      FoundRange             ;cx=range number found
    loop    ScanRange
FoundRange:                          ;cx=range number found
```

Temperature for starting point - Register al contains temperature

[illegible]

123. (New) An apparatus, comprising:

a <u>temperature controller</u> (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

<u>a clock manager</u> (M) adapted to receive a control signal from said temperature controller, said clock manager selectively <u>stopping clock signals from being sent to a processing unit</u> when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(T) a <u>temperature controller ...</u>

```
SetTrange:
    xchg    al,cl                       ;Al has temp back; ah=index
    mov     cx,7                        ;cx = loop count

ScanRange:
    mov     bx,cx
    add     bl,ah                       ;Over index for ac or dc
    cmp     al,byte ptr cs:[TempRange+bx]
    je      FoundRange                  ;cx=range number found
    loop    ScanRange
FoundRange:                             ;CX=range number found

    mov     al,39h                      ;Read Keyboard channel
access flag
    Call    CmosRead
    mov     al,ah
    and     al,3                        ;Last Temperature range
    and     ah,0C0h                     ;Upper direction trend value
    cmp     cl,al                       ;Value of cmos read
    je      RangeStable                 ;Stable process, same range
    jg      RangeUpward                 ;New range is greater than
old one
;                                       ;Range is downward trend
    cmp     ah,10000000b                ;Lastone upward?
    je      RangeOSC                    ;Yes, found osc
    mov     ch,01h
    jmp     short   AllRange
RangeOSC:
    mov     ch,0C0h                     ;OSC flag
    jmp     short   AllRange
RangeStable:
    mov     ch,00h
    jmp     short   AllRange
RangeUpward:
    cmp     ah,01000000b                ;Last one Downward?
    je      RangeOSC                    ;Yes. Osc found
    mov     ch,10
```

```
AllRange:
    or      ch,cl                       ;Range and range temp trend
    mov     ah,cl
    mov     al,39h                      ;note that I clr later )
bits for status complete
    Call    CmosWrite

ClearBusyKeyChannel:
    mov     ax,0019h                    ;free Channel
    mov     bl,10000000b                ;Mask to write
    call    CmosWriteMask               ;Bit updated
BusyKeyChannel:
    pop     cx                          ;3-18-93vw
    pop     bx                          ;3-18-93vw
    pop     ax                          ;3-18-93vw

    popf                                ;Restore status and
```

EXHIBIT L-8

Predicting future changes
By studying trend to be downward,
Upward, stable, or oscillating.

[redacted]

123. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(M) a a clock manager ...

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

Leaves clock speed the same

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
        call    UpdateTemperature          ;Do it
        mov     al,3ah
        call    CmosRead                   ;Read Temperature byte
        mov     al,ah                      ;Direction/Time/Level
        and     ah,3Fh                     ;Just the time and level
please
        mov     bh,al                      ;Get the direction
        and     al,7                       ;Level computed for Temp
range
        and     bh,11000000b               ;Direction

        cmp     ah,0                       ;Good read?
        jne     LeaveDownCountT            ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b               ;OSC?
        jne     NotTR_OSC                  ;Nop!
```

[redacted]

EXHIBIT I-2

123. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(U) ... said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature

```
;
;       OSC, so set the temp level up by one
;
    mov     bh,00000000b            ;Force downward
    cmp     al,7                    ;Already at max?
    je      NotTR_OSC               ;yep, leave alone
    inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
    mov     ah,7                    ;Max  available
    sub     ah,al                   ;7-7 = 0 so watch it!
    cmp     ah,0
    jne     NotBig2                 ;Not zero
    inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                  ;Align the time constant
    or      ah,bh                   ;Align the direction
    or      ah,al                   ;Align the TRange
    mov     bl,al                   ;TRange
    mov     bh,0                    ;Upper index.
;
;       Need to setup the Doze Value based on current TRange
;
    push    ax

IFDEF   zzzlllyp                     ;5.08.1 6-3-95vw Set Doze
value
    mov     ah,byte ptr cs:TDozeTable[bx]
    mov     al,54h                  ; Index register to write
    call    CfgWrite
```

[redacted]

Rising or Lowering at Acceptable rate, if index goes down, clock speed goes up- Clock frequency increases. Direction will indicate upward trend.

Computes Clock Speed

Receive clock speed to set for processor (CPU)

EXHIBIT V-108

123. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(U) … said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature

Modifies clock speed, clock frequency

```
;
;       Need to setup the Code Value based on current TRange
;
        push    ax

IFDEF   axelilyp                        ;5.08.1 6-3-95mw Get Code
value
        mov     ah,byte ptr cs:TCodeTable[bx]
        mov     al,34h                  ; Index register to write
        call    ClgWrite
ENDIF   ;axelilyp

IFDEF   axelilyd                        ;5.08.1 6-3-95mw Add dcode
code here
ENDIF   ;axelilyd

        pop     ax                      ; Minutes to next scan
WriteDownCountT:
        mov     al,3ah
        call    CmosWrite               ; Write it out
LeaveDownCountT:
        pop     bx
        pop     ax
        popf                            ;Restore Interrupts
        ret

TCodeTable:
        db      00h                     ; Disabled
        db      19h                     ; 2 sec's
        db      1Bh                     ; 1 sec
        db      1Bh                     ; 1/2 sec
        db      1Bh,1Bh,1Bh,1Bh,1Bh     ;4.48b  5-11-95
;       db      20h                     ; 1/4 sec
```

EXHIBIT 1-3

[redacted]

```
TempRange       label   byte
DCTempRange     label   byte
        db      0ch             ;Level 0
        db      0eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1ah             ;Level 7

ACTempRange     label   byte
        db      19h             ;Level 0
        db      1bh             ;Level 1
        db      1dh             ;Level 2
        db      1fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpDateTemperature       endp
```

EXHIBIT 1-4

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lillyp products, the tables changed to under them also (see 4.48b 5-11-95)

Reference Temperature

EXHIBIT V-109

123. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(U) ... said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature

EXHIBIT I-3

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBigZ                 ;Not zero
        inc     ah                      ;Look at every minute
NotBigZ:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
```

Tlevel sets time – based on acceptable level of temperature rise or fall (direction gives rise or fall, and TRange give temperature Low and Max in range. Acceptable rate is time and temperature based dependent on direction of trend.

EXHIBIT V-110

123. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(U) … said clock manager selectively stopping clock signals from being sent to a processing unit when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature

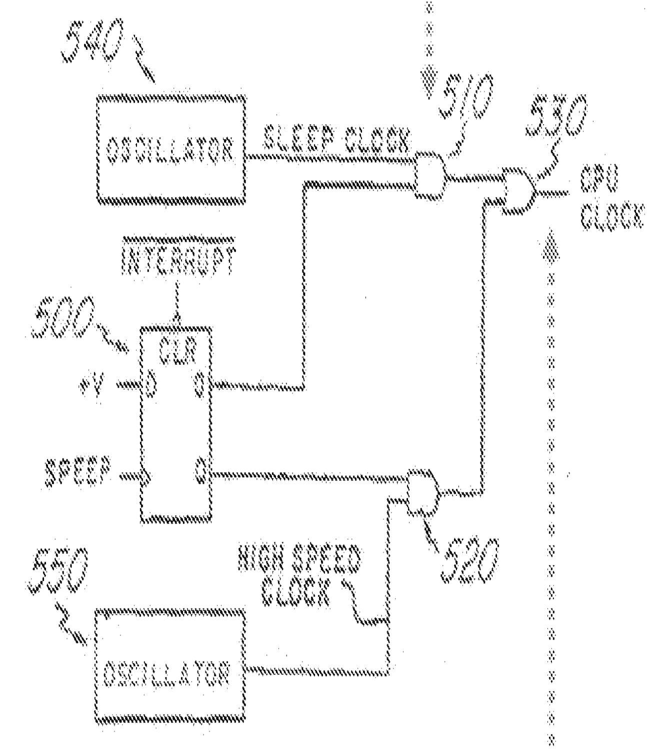



Fig. 3

Rising faster than Acceptable rate, forces second clock signal

[redacted]

Computes Clock Signal

Receive a First or Second clock signal

# Claim 124

124. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a **clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (S)

# Claim 124

124. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a **clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(T) a **temperature controller ...**

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
        call    UpdateTemperature       ;Do it
        mov     al,3ah
        call    CmosRead                ;Read Temperature byte
        mov     al,ah                   ;Direction/Time/Level
        and     ah,38h                  ;Just the time and level
please
        mov     bh,al                   ;Get the direction
        and     al,7                    ;Level computed for Temp
range
        and     bh,11000000b            ;Direction

        cmp     ah,0                    ;Good read?
        jne     LeaveDownCountT         ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b            ;OSC?
        jne     NotTR_OSC               ;Nop!
```

Leaves clock speed the same

[redacted]

124. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(T) a temperature controller ...

The Temperature Controller

EXHIBIT I-4

```
;
;       Read the Temperature on the system board controlled by
Keyboard Controller
;
;       Calling Arguments
;
;       Call    UpDateTemperature
;       ON exit, the cmos parameter will contain the correct
values
;
```

[redacted]

```
        mov     al,0c4h                 ;Output the read A/D.
        out     54h,al
testkbc_2:
        loop    testkbc_2_Okay          ;3-10-95vw Don't hang here
        jmp     ClearBusyKeyChannel     ;3-30-95vw?Should we flush
here?
testkbc_2_Okay:                           ;3-10-95vw
        jmp     $+2
        in      al,54h                  ;read status port
        jmp     $+2
        jmp     $+2
        test    al,2                    ;check status of input port
```

EXHIBIT I-5

```
        in      al,50h                  ;full, then, get A/D value

        cmp     al,0ffh                 ;valid value?
        je      ClearBusyKeyChannel     ;Nop!           3-17-95vw
                ;DEBUG CODE..WAtts 3-12-95vw INACTIVE
        cmp     al,00h
        je      ClearBusyKeyChannel     ;Nop!  3-17-95vw
        push    ax
        mov     ah,55h
        xchg    al,ah
```

EXHIBIT I-6

Reads Temperature for starting point

Register al contains temperature

Channels 64 was changed to 54 and 60 was changed to 50 after 9/15/94. Does not affect invention, just make product work better for multitasking operating systems. Same temperature was obtained either way. Channels 60 and 64 used for FCC and UL agency testing. Implementation was functional and complete for patent purpose by 9/15/94.

EXHIBIT V-114

124. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(T) a temperature controller ...

The Temperatu Controller

EXHIBIT I-8

```
SetTrange:
     xchg    al,cl                  ;Al has temp back; ah=index
     mov     cx,7                   ;cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                  ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange             ;cx=range number found
     loop    ScanRange
FoundRange:                          ;cx=range number found
```

Temperature for starting point - Register al contains temperature

[redacted]

124. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(T) a temperature controller ...

```
SetTrange:
     xchg    al,cl                 ;Al has temp back; ah=index
     mov     cx,7                  ;cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                 ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jb      FoundRange            ;CX=range number found
     loop    ScanRange
FoundRange:                        ;CX=range number found

     mov     al,39h                ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,3                  ;Last Temperature range
     and     ah,0c0h               ;Upper direction trend value
     cmp     cl,al                 ;Value of cmos read
     je      RangeStable           ;Stable process, same range
     jg      RangeUpward           ;New range is greater than
old one
;                                    ;Range is downward trend
     cmp     ah,10000000b          ;Lastone upward?
     je      RangeOSC              ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h               ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b          ;Last one Downward?
     je      RangeOSC              ;Yes. Osc found
     mov     ch,10
```

```
AllRange:
     or      ch,cl                 ;Range and range temp trend
     mov     ah,cl
     mov     al,39h                ;Note that I dif inter )
bits for status complete
     call    CmosWrite

ClearBusyKeyChannel:
     mov     al,00039h             ;Free Channel
     mov     bl,10000000b          ;Mask to write
     call    CmosWriteMask         ;Bit updated
BusyKeyChannel:
     pop     cx                    ;3-18-95vv
     pop     bx                    ;3-18-95vv
     pop     ax                    ;3-18-95vv

     popf                          ;Restore status and
```

EXHIBIT X-8

Trend up, last up and this up more than last time, forcing index in TDozeTable to increase and this will decrease clock speed and clock frequency.

Predicting future changes
By studying trend to be downward, Upward, stable, or oscillating.

[redacted]

124. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a **clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(M) a a clock manager ...

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
than
;       we had one, else we need to leave it along.
;
        call    UpdateTemperature              ;Do it
        mov     al,3ah
        call    CmosRead                       ;Read Temperature byte
        mov     al,ah                          ;Direction/Time/Level
        and     ah,38h                         ;Just the time and level
please
        mov     bh,al                          ;Get the direction
        and     al,7                           ;Level computed for Temp
range
        and     bh,11000000b                   ;Direction

        cmp     ah,0                           ;Good read?
        jne     LeaveDownCount?                ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b                   ;OSC?
        jne     NotTR_OSC                      ;Nop!
```

Leaves clock speed the same

[redacted]

EXHIBIT I-2

EXHIBIT V-117

124. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(U) ... said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature.

[redacted]

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it;
        cmp     ah,0
        jne     NotBig2                 ;Not zero
        inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
;
;       Need to setup the Doze Value based on current TRange
;
        push    ax

IFDEF   zzzlilyp                        ;5.08.1 6-3-95vw Set Doze
value
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,54h                  ; Index register to write
        call    CfgWrite
```

Rising faster than Acceptable rate, forces lower clock speed

Computes Clock Speed

Receive clock speed to set for processor (CPU)

EXHIBIT V-118

124. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(U) … said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature.

[redacted]

Modifies clock speed

```
;
;       Need to setup the Doze Value based on current TRange
;
        push    bx

IFDEF   xxxlilyp                        ;5.08.1 6-3-95ww Set Doze Value
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,5Ah                  ; Index register to write
        call    CfgWrite
ENDIF   ;xxxlilyp

IFDEF   xxxlilyd                        ;5.08.1 6-3-95ww Add doze code here
ENDIF   ;xxxlilyd

        pop     bx                      ; Minutes to next scan
WriteDownCount?:
        mov     al,3ah
        call    CmosWrite               ; Write it out
LeaveDownCount?:
        pop     bx
        pop     ax
        popf                            ;Restore Interrupts
        ret

TDozeTable:
        db      00h                     ; Disabled
        db      38h                     ; 2 sec's
        db      30h                     ; 1 sec
        db      28h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4.48b  5-11-95
;       db      20h                     ; 1/4 sec
```

EXHIBIT I-3

```
TempRange       label   byte
DCTempRange     label   byte
        db      0ch             ;Level 0
        db      0eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1ah             ;Level 7

ACTempRange     label   byte
        db      19h             ;Level 0
        db      1bh             ;Level 1
        db      1dh             ;Level 2
        db      1fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpdateTemperature       endp
```

EXHIBIT I-4

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lillyp products, the tables changed to under them also (see 4.48b 5-11-95)

Reference Temperature

EXHIBIT V-119

124. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(U) … said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature.

[redacted]

EXHIBIT I-3

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBig2                 ;Not zero
        inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index.
```

Tlevel sets time – based on acceptable level of temperature rise or fall (direction gives rise or fall, and TRange give temperature Low and Max in range. Acceptable rate is time and temperature based dependent on direction of trend.

124. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a **clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature. (U)

(U) ... said clock manager reducing processing unit clock speed when said monitored temperature rises to at least a selected reference temperature and thereafter continues to rise on successive readings of said monitored temperature.

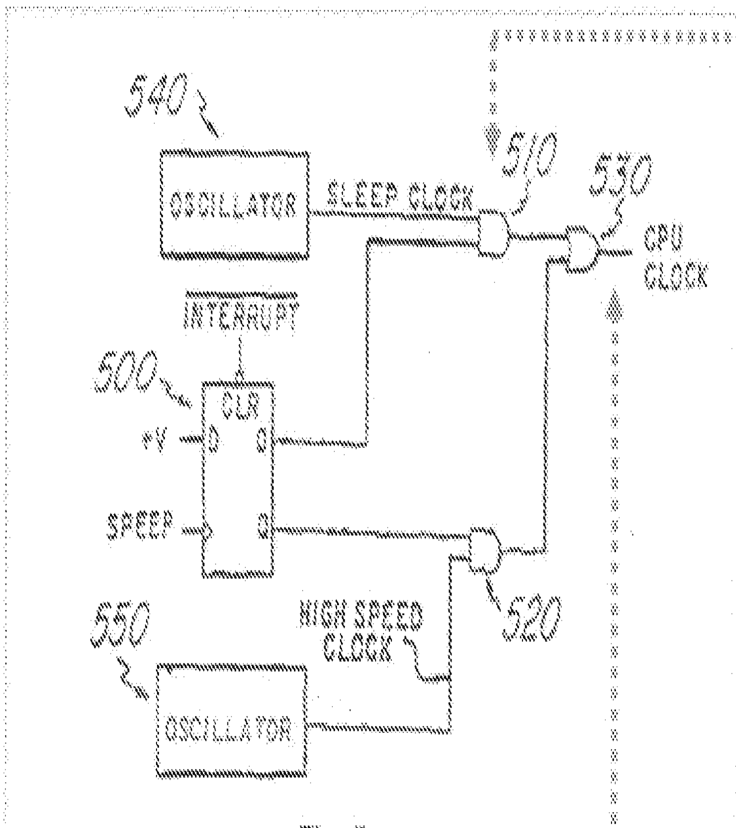


Fig. 3

Rising faster than Acceptable rate, forces second clock signal

Computes Clock Signal

Receive a First or Second clock signal

# Claim 125

125. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively <u>stopping clock signals from being sent to a processing</u> unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(T) a **temperature controller ...**

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.

        call    UpdateTemperature          ;Do it
        mov     al,3ah
        call    CmosRead                   ;Read Temperature byte
        mov     al,ah                      ;Direction/Time/Level
        and     ah,38h                     ;Just the time and level
please
        mov     bh,al                      ;Get the direction
        and     al,7                       ;Level computed for Temp
range
        and     bh,11000000b               ;Direction

        cmp     ah,0                       ;Good read?
        jne     LeaveDownCountT            ;Nop, leave it along

;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b               ;OSC?
        jne     NotTR_OSC                  ;Nop!
```

Leaves clock speed the same

[illegible]

EXHIBIT I-2

EXHIBIT V-122

125. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(T) a temperature controller ...

The Temperature Controller

EXHIBIT I-4

```
;
;       Read the Temperature on the system board controlled by
Keyboard Controller
;
;       Calling Arguments
;
;       Call    UpDateTemperature
;       ON exit, the cmos parameter will contain the correct
values
;
```

[redacted]

```
        mov     al,0d4h                 ;Output the read A/D.
        out     54h,al
  testKbc_2:
        loop    testKbc_2_Okay          ;3-30-95vw Don't hang here
        jmp     ClearBusyKeyChannel     ;3-30-95vw?Should we flush
  here?
  testKbc_2_Okay:                       ;3-30-95vw
        jmp     $+2
        in      al,54h                  ;read status port
        jmp     $+2
        jmp     $+2
        test    al,2                    ;check status of input port
```

EXHIBIT I-5

```
        in      al,50h                  ;Poll, then, get A/D value

        cmp     al,0ffh                 ;valid value?
        je      ClearBusyKeyChannel     ;Nop!           3-17-95vw
                        ;DEBUG CODE..Watts 3-12-95vw INACTIVE
        cmp     al,00h
        je      ClearBusyKeyChannel     ;Nop!  3-17-95vw
        push    ax
        mov     ah,55h
        xchg    al,ah
```

EXHIBIT I-6

Reads Temperature for starting point

Register al contains temperature

Channels 64 was changed to 54 and 60 was changed to 50 after 9/15/94. Does not affect invention, just make product work better for multitasking operating systems. Same temperature was obtained either way. Channels 60 and 64 used for FCC and UL agency testing. Implementation was functional and complete for patent purpose by 9/15/94.

125. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(T) a **temperature controller ...**

The Temperatu Controller

EXHIBIT I-8

```
SetTrange:
    xchg    al,cl                           ;Al has temp back; ah=index
    mov     cx,7                            ;cx = loop count

ScanRange:
    mov     bx,cx
    add     bl,ah                           ;Over index for ac or dc
    cmp     al,byte ptr cs:[TempRange+bx]
    jg      FoundRange                      ;cx=range number found
    loop    ScanRange
FoundRange:                                     ;cx=range number found
```

Temperature for starting point - Register al contains temperature

[redacted]

125. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(T) a temperature controller ...

```
SetCrange:
     xchg    al,cl                       ;Al has temp back: ah=index
     mov     cx,7                        ;cx = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                       ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange                  ;cx=range number found
     loop    ScanRange
FoundRange:                              ;cx=range number found

     mov     al,39h                      ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,3                        ;Last Temperature range
     and     ah,0C0h                     ;Upper direction trend value
     cmp     cl,al                       ;Value of cmos read
     je      RangeStable                 ;Stable process, same range
     jg      RangeUpward                 ;New range is greater than
old one
;                                          ;Range is downward trend
     cmp     ah,10000000b                ;Lastone upward?
     je      RangeOSC                    ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0C0h                     ;Osc flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b                ;Last one Downward?
     je      RangeOSC                    ;Yes. Osc found
     mov     ch,10
```

```
AllRange:
     or      ch,cl                       ;Range and range temp trend
     mov     ah,cl
     mov     al,39h                      ;note that 1 ctr later ?
bits for status complete
     Call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0037h                    ;Free Channel
     mov     bl,10000000b                ;Mask to write
     call    CmosWriteMask               ;Bit updated
BusyKeyChannel:
     pop     cx                          ;1-18-95ww
     pop     bx                          ;1-18-95ww
     pop     ax                          ;1-18-95ww

     popf                                ;Restore status and
```

EXHIBIT L-8

Predicting future changes
By studying trend to be downward,
Upward, stable, or oscillating.

[redacted]

125. (New) An apparatus, comprising:

a <u>temperature controller</u> (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

<u>a clock manager</u> (M) adapted to receive a control signal from said temperature controller, said clock manager selectively <u>stopping clock signals from being sent to a processing</u> unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(M) a <u>a clock manager ...</u>

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

Leaves clock speed the same

```
DoK8ThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
        call    UpdateTemperature           ;Do it
        mov     al,3ah
        call    CmosRead                    ;Read Temperature byte.
        mov     al,ah                       ;Direction/Time/Level
        and     ah,3fh                      ;Just the time and level
please
        mov     bh,al                       ;Get the direction
        and     al,7                        ;Level computed for Temp
range
        and     bh,11000000b                ;Direction

        cmp     ah,0                        ;Good read?
        jne     LeaveDownCountT             ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b                ;OSC?
        jne     NotTR_OSC                   ;Nop!
```

[redacted]

EXHIBIT I-2

EXHIBIT V-126

125. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(U) … said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature.

```
;
;       OSC, so set the temp level up by one
;
    mov     bh,00000000b            ;Force downward
    cmp     al,7                    ;Already at max?
    je      NotTR_OSC               ;yep, leave alone
    inc     al                      ;force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
    mov     ah,7                    ;Max  available
    sub     ah,al                   ;7-7 = 0 so watch it!
    cmp     ah,0
    jne     NotBig2                 ;Not zero
    inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                  ;Align the time constant
    or      ah,bh                   ;Align the direction
    or      ah,al                   ;Align the TRange
    mov     bl,al                   ;TRange
    mov     bh,0                    ;Upper index.
;
;       Need to setup the Doze Value based on current TRange
;
    push    ax

IFDEF   zzzlilyp                    ;5.08.1 6-3-95ww Set Doze
value
    mov     ah,byte ptr cs:TDozeTable[bx]
    mov     al,54h                  ; Index register to write
    call    CfgWrite
```

Rising or Lowering at Acceptable rate, if index goes down, clock speed goes up- Clock frequency increases. Direction will indicate upward trend.

Computes Clock Speed

Receive clock speed to set for processor (CPU)

125. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(U) ... said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature.

Modifies clock speed, clock frequency

```
;
;       Need to setup the Doze Value based on current TRange
;
        push    bx

IFDEF   xxxlilyp                        ;5.08.1 6-3-95vw Set Doze
Value
        mov     al,byte ptr cs:TDozeTable[bx]
        mov     si,33h                  ; Index register to write
        call    CfgWrite
ENDIF   ;xxxlilyp

IFDEF   xxxlilyd                        ;5.08.1 6-3-95vw add doze
code here
ENDIF   ;xxxlilyd

        pop     ax                      ; Minutes to next scan
WriteDownCount?:
        mov     si,3?h
        call    CmosWrite               ; Write it out
LeaveDownCount?:
        pop     bx
        pop     ax
        popf                            ;Restore Interrupts
        ret

TDozeTable:
        db      00h                     ; Disabled
        db      30h                     ; 2 sec's
        db      10h                     ; 1 sec
        db      20h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4.48b  5-11-95
;       db      20h                     ; 1/4 sec
```

EXHIBIT I-3

```
TempRange       label   byte
DCTempRange     label   byte
        db      0Ch             ;Level 0
        db      0Eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1Ah             ;Level 7

ACTempRange     label   byte
        db      19h             ;Level 0
        db      1Bh             ;Level 1
        db      1Dh             ;Level 2
        db      1Fh             ;Level 3
        db      21h             ;Level 4
        db      23h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpdateTemperature       endp
```

EXHIBIT I-9

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lilyp products, the tables changed to under them also (see 4.48b 5-11-95)

Reference Temperature

EXHIBIT V-128

125. (New) An apparatus, comprising:

a <u>temperature controller</u> (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

<u>a clock manager</u> (M) adapted to receive a control signal from said temperature controller, said clock manager selectively <u>stopping clock signals from being sent to a processing</u> unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(U) … said clock manager selectively <u>stopping clock signals from being sent to a processing</u> unit in response to successive readings of said monitored temperature indicating an upward trend in temperature.

[redacted]

EXHIBIT I-3

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBig2                 ;Not zero
        inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper Index.
```

Tlevel sets time – based on acceptable level of temperature rise or fall (direction gives rise or fall, and TRange give temperature Low and Max in range. Acceptable rate is time and temperature based dependent on direction of trend.

125. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

**a clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(U) … said clock manager selectively stopping clock signals from being sent to a processing unit in response to successive readings of said monitored temperature indicating an upward trend in temperature.

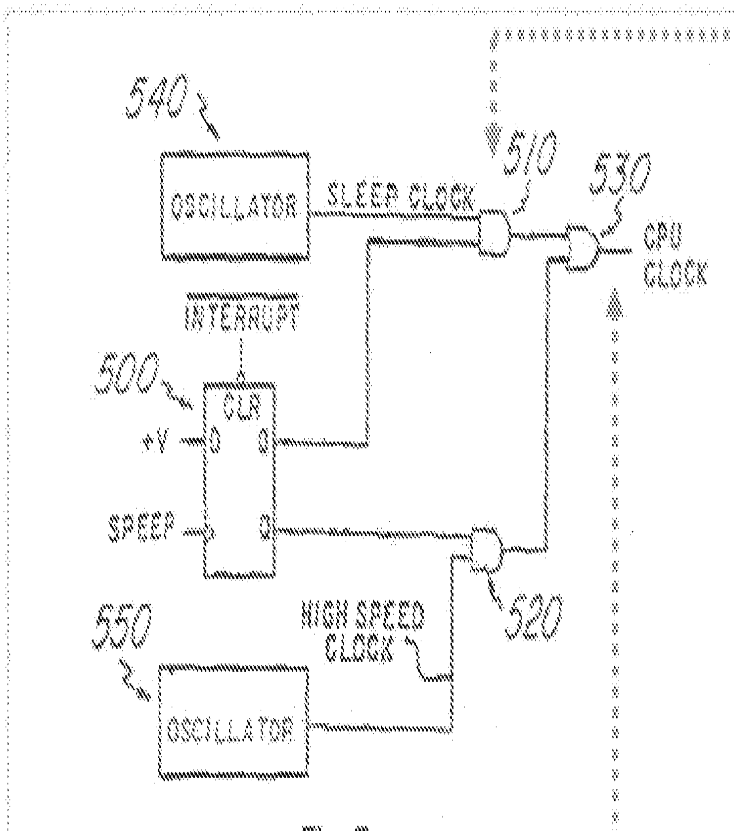


Fig. 3

Rising faster than Acceptable rate, forces second clock signal

[redacted]

Computes Clock Signal

Receive a First or Second clock signal

# Claim 126

126. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a **clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(T) a **temperature controller ...**

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

Leaves clock speed the same

```
DoKBThermalRead:
;
;       Try for a Thermal Management hit: return time count = 0
then
;       we had one, else we need to leave it along.
;
        call    UpdateTemperature           ;Do it
        mov     al,3ah
        call    CmosRead                    ;Read Temperature byte
        mov     al,ah                       ;Direction/Time/Level
        and     ah,38h                      ;Just the time and level
please
        mov     bh,al                       ;Get the direction
        and     al,7                        ;Level computed for Temp
range
        and     bh,11000000b                ;Direction

        cmp     ah,0                        ;Good read?
        jne     LeaveDownCount?             ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b                ;OSC?
        jne     NotTR_OSC                   ;Nop!
```

[redacted]

EXHIBIT I-2

EXHIBIT 131

126. (New) An apparatus, comprising:

a <u>temperature controller</u> (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a <u>clock manager</u> (M) adapted to receive a control signal from said temperature controller, said clock manager <u>reducing processing unit clock speed</u> in response to successive readings of said monitored temperature indicating an <u>upward trend in temperature</u>. (U)

(T) a <u>temperature controller ...</u>

The Temperature Controller

EXHIBIT I-4

```
;
;       Read the Temperature on the system board controlled by
Keyboard Controller
;
;       Calling Arguments
;
;       Call    UpDateTemperature
;       ON exit, the cmos parameter will contain the correct
values
;
```

[redacted]

```
        mov     al,0d4h                 ;Output the read A/D.
****    out     64h,al
  testkbc_2:
        loop    testkbc_2_Okay          ;3-10-95vw Don't hang here
        jmp     ClearBusyKeyChanel      ;3-10-95vw?Should we flush
  here?
  testkbc_2_Okay:                         ;3-10-95vw
        jmp     $+2
****    in      al,64h                  ;read status port
        jmp     $+2
        jmp     $+2
        test    al,2                    ;check status of input port
```

EXHIBIT I-5

```
****    in      al,60h                  ;Poll. then, get A/D value

        cmp     al,0ffh                 ;valid value?
        je      ClearBusyKeyChannel     ;Nop!         3-17-95vw
                ;DEBUG CODE..Watts 3-12-95vw INACTIVE
        cmp     al,00h
        je      ClearBusyKeyChannel     ;Nop!  3-17-95vw
        push    ax
        mov     ah,33h
        xchg    al,ah
```

EXHIBIT I-6

Reads Temperature for starting point

Register al contains temperature

Channels 64 was changed to 54 and 60 was changed to 50 after 9/15/94. Does not affect invention, just make product work better for multitasking operating systems. Same temperature was obtained either way. Channels 60 and 64 used for FCC and UL agency testing. Implementation was functional and complete for patent purpose by 9/15/94.

EXHIBIT V-132

128. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a **clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(T) a **temperature controller ...**

The Temperatu Controller

EXHIBIT I-8

```
SetTrange:
     xchg    al,cl                   ;Al has temp back; ah=index
     mov     cx,7                    ;CX = loop count

ScanRange:
     mov     bx,cx
     add     bl,ah                   ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange              ;cx=range number found
     loop    ScanRange
FoundRange:                           ;cx=range number found
```

Temperature for starting point - Register al contains temperature

[redacted]

125. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (W) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(T) a temperature controller ...

```
SetTrange:
     xchg    al,cl                    ;Al has temp back; ah=index
     mov     cx,7                     ;CX = loop count

ScanRange:
     mov     bx,cx
     and     bl,ah                    ;Over index for ac or dc
     cmp     al,byte ptr cs:[TempRange+bx]
     jg      FoundRange               ;cx=range number found
     loop    ScanRange
FoundRange:                           ;CX=range number found

     mov     al,18h                   ;Read Keyboard channel
access flag
     Call    CmosRead
     mov     al,ah
     and     al,7                     ;Last Temperature range
     and     ah,0c0h                  ;Upper direction trend value
     cmp     cl,al                    ;Value of cmos read
     je      RangeStable              ;Stable process, same range
     jg      RangeUpward              ;New range is greater than
old one
;                                       ;Range is downward trend
     cmp     ah,10000000b             ;Lastone upward?
     je      RangeOSC                 ;Yes, found osc
     mov     ch,01h
     jmp     short   AllRange
RangeOSC:
     mov     ch,0c0h                  ;OSC flag
     jmp     short   AllRange
RangeStable:
     mov     ch,00h
     jmp     short   AllRange
RangeUpward:
     cmp     ah,01000000b             ;Last one Downward?
     je      RangeOSC                 ;Yes. Osc found
     mov     ch,10
```

Predicting future changes
By studying trend to be downward,
Upward, stable, or oscillating.

```
AllRange:
     or      ch,cl                    ;Range and range temp trend
     mov     ah,cl
     mov     al,18h                   ;Note that I clr index 3
bits for status Complete
     Call    CmosWrite

ClearBusyKeyChannel:
     mov     ax,0003h                 ;Free Channel
     mov     bl,10000000b             ;Mask to write
     call    CmosWriteMask            ;Bit updated
BusyKeyChannel:
     pop     cx                       ;3-18-89vw
     pop     bx                       ;3-18-89vw
     pop     ax                       ;3-18-89vw

     popf                             ;Restore status and
```

EXHIBIT L-8

[redacted]

EXHIBIT V-134

126. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(M) a a clock manager ...

The Clock Manager – receives control signal from temperature controller

The Temperature Controller

```
DoK8ThermalRead:
;
;       Try for a Thermal Management hit; return time count = 0
then
;       we had one, else we need to leave it along.
        call    UpdateTemperature               ;Do it
        mov     al,3ah
        call    CmosRead                        ;Read Temperature byte
        mov     al,ah                           ;Direction/Time/Level
        and     ah,38h                          ;Just the time and level
please
        mov     bh,al                           ;Get the direction
        and     al,7                            ;Level computed for Temp
range
        and     bh,11000000b                    ;Direction

        cmp     ah,0                            ;Good read?
        jne     LeaveDownCountT                 ;Nop, leave it along
;
;       This is where we do some thermal management
;       Hold ah value or reset it as needed...
;
        cmp     bh,11000000b                    ;OSC?
        jne     NotTR_OSC                       ;Nop!
```

Leaves clock speed the same

[redacted]

EXHIBIT I-2

EXHIBIT V-135

126. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a **clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(U) ... said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature.

```
;
;       OSC, so set the temp level up by one
;
     mov     bh,00000000b              ;Force downward
     cmp     al,7                      ;Already at max?
     je      NotTR_OSC                 ;yep, leave alone
     inc     al                        ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
     mov     ah,7                      ;Max  available
     sub     ah,al                     ;7-7 = 0 so watch it!
     cmp     ah,0
     jne     NotBig2                   ;Not zero
     inc     ah                        ;Look at every minute
NotBig2:shl     ah,3                      ;Align the time constant
     or      ah,bh                     ;Align the direction
     or      ah,al                     ;Align the TRange
     mov     bl,al                     ;TRange
     mov     bh,0                      ;Upper index.
;
;       Need to setup the Doze Value based on current TRange
;
     push    ax

IFDEF   zzzlilyp                         ;5.08.1 6-3-95vw Set Doze
Value
     mov     ah,byte ptr cs:TDozeTable[bx]
     mov     al,54h                    ; Index register to write
     call    CfgWrite
```

[redacted]

Rising or Lowering at Acceptable rate, if index goes down, clock speed goes up- Clock frequency increases. Direction will indicate upward trend.

Computes Clock Speed

Receive clock speed to set for processor (CPU)

126. (New) An apparatus, comprising:

a temperature controller (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a clock manager (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(U) ... said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature.

Modifies clock speed, clock frequency

```
;
;       Need to setup the Doze Value based on current TRange
;
        push    ax

IFDEF   xxxlilyp                        ;5.08.1 6-3-95vw Set Doze
Value
        mov     ah,byte ptr cs:TDozeTable[bx]
        mov     al,54h                  ; Index register to write
        call    CfgWrite
ENDIF   ;xxxlilyp

IFDEF   xxxlilyd                        ;5.08.1 6-3-95vw add doze
code here
ENDIF   ;xxxlilyd

        pop     ax                      ; Minutes to next scan
WriteDownCountT:
        mov     al,1ah
        call    CmosWrite               ; Write it out
LeaveDownCountT:
        pop     bx
        pop     ax
        popf                            ;Restore Interrupts
        ret

TDozeTable:
        db      00h                     ; Disabled
        db      30h                     ; 2 sec's
        db      30h                     ; 1 sec
        db      28h                     ; 1/2 sec
        db      28h,28h,28h,28h,28h     ;4.48b  5-11-95
;               db      20h                     ; 1/4 sec
```

EXHIBIT I-3

```
TempRange       label   byte
DCTempRange     label   byte
        db      0ch             ;Level 0
        db      0eh             ;Level 1
        db      10h             ;Level 2
        db      12h             ;Level 3
        db      14h             ;Level 4
        db      16h             ;Level 5
        db      18h             ;Level 6
        db      1ah             ;Level 7

ACTempRange     label   byte
        db      10h             ;Level 0
        db      10h             ;Level 1
        db      14h             ;Level 2
        db      1Ch             ;Level 3
        db      20h             ;Level 4
        db      22h             ;Level 5
        db      25h             ;Level 6
        db      27h             ;Level 7

UpdateTemperature       endp
```

EXHIBIT I-4

Note: The Macro "IFDEF" was added on 6-3-95 because This code was used for another Product also called lilyd. The original code that was Working by 9/15/94 is there, the Macro for lilyd does not have Any code generation as of yet Here since it was not written for The new product. As faster processors were added to lillyp products, the tables changed to under them also (see 4.48b 5-11-95)

Reference Temperature

EXHIBIT V-137

126. (New) An apparatus, comprising:

a <u>**temperature controller**</u> (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a <u>**clock manager**</u> (M) adapted to receive a control signal from said temperature controller, said clock manager <u>reducing processing unit clock speed</u> in response to successive readings of said monitored temperature indicating an <u>upward trend in temperature</u>. (U)

(U) ... said clock manager <u>reducing processing unit clock speed</u> in response to successive readings of said monitored temperature indicating an <u>upward trend in temperature</u>.

EXHIBIT I-3

```
;
;       OSC, so set the temp level up by one
;
        mov     bh,00000000b            ;Force downward
        cmp     al,7                    ;Already at max?
        je      NotTR_OSC               ;yep, leave alone
        inc     al                      ;Force level temp up by one
NotTR_OSC:
;
;       Time needs to be set based on T Level
;
        mov     ah,7                    ;Max  available
        sub     ah,al                   ;7-7 = 0 so watch it!
        cmp     ah,0
        jne     NotBig2                 ;Not zero
        inc     ah                      ;Look at every minute
NotBig2:shl     ah,3                    ;Align the time constant
        or      ah,bh                   ;Align the direction
        or      ah,al                   ;Align the TRange
        mov     bl,al                   ;TRange
        mov     bh,0                    ;Upper index..
```

Tlevel sets time – based on acceptable level of temperature rise or fall (direction gives rise or fall, and TRange give temperature Low and Max in range. Acceptable rate is time and temperature based dependent on direction of trend.

EXHIBIT V-138

126. (New) An apparatus, comprising:

a **temperature controller** (T) for monitoring temperature associated said apparatus and, using said monitored temperature at least once as a starting point, predicting future changes in said monitored temperature; and

a **clock manager** (M) adapted to receive a control signal from said temperature controller, said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature. (U)

(U) ... said clock manager reducing processing unit clock speed in response to successive readings of said monitored temperature indicating an upward trend in temperature.

Rising faster than Acceptable rate, forces second clock signal

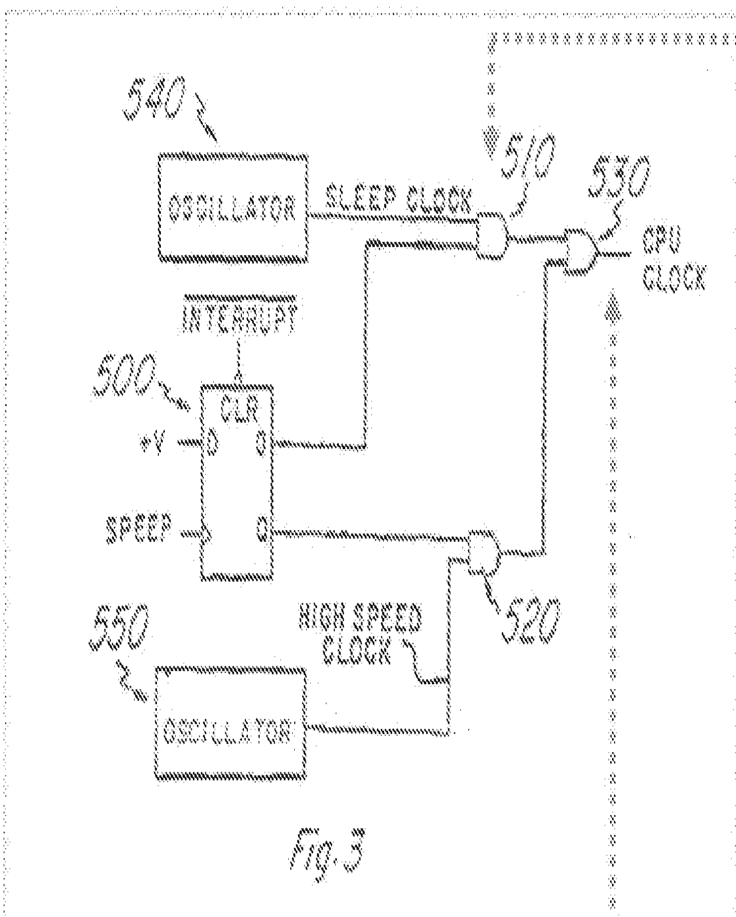


Fig. 3

[redacted]

Computes Clock Signal

Receive a First or Second clock signal

| | 5/4/1994 | 7/20/1994 | 8/30/1994 | 9/14/1994 | 9/15/1994 | 10/14/1994 | 11/8/1994 | 11/19/1994 | 12/15/1994 | 2/11/1995 | 2/25/1995 | 3/12/1995 | 3/24/1995 | 5/11/1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coding Started on various programs/subroutines (example APM530f.asm -enable/disable Power Management) | Started | | | | | | | | | | | | | |
| HI_PWR.exe created | | Completed | | | | | | | | | | | | |
| HEAT.BAT used for Heat Testing Last Modified | | | | Completed | | | | | | | | | | |
| TEMPTM5.INC functionality completed and heat testing started with New HEAT.BAT | | | | | Completed | | | | | | | | | |
| RAM Based functional implementation Completed | | | | | Completed | | | | | | | | | |
| ...Temperatures and control signals stored in CMOS RAM area to be read by control logic for predicting future temperature such as Up, Down, Stable, or Oscillating. | | | | | Completed | | | | | | | | | |
| Logic completed for Claims: | | | | | Completed | | | | | | | | | |
| ...Claims 17 and 18 working in prototype | | | | | Completed | | | | | | | | | |
| ...Claims 21, 23, 74-76 working in prototype | | | | | Completed | | | | | | | | | |
| ...Claims 77, 78, 79,80, 81, and 82 (Prototype Unit completed used keyboard, LCD Display, and Intel CPU) | | | | | Completed | | | | | | | | | |
| ...Claims 83,84,and 85 (Prototype Unit completed used PCI Bus coupled to CPU) | | | | | Completed | | | | | | | | | |
| ...Claims 83,84,and 85 (Prototype Unit completed used PCI Bus coupled to CPU with PCMCIA controller) | | | | | Completed | | | | | | | | | |
| ...Claims 89-94 (Prototype Unit completed used keyboard controller and port 60/64h to get temperature) | | | | | Completed | | | | | | | | | |
| ...Claims 95-100 (Prototype Unit completed but limitation of technology forced usage of adjacent sensor to CPU) | | | | | Conceived | | | | | | | | | |
| ...Claims 101-106 working in prototype | | | | | Completed | | | | | | | | | |
| ...Claims 110-113, 116-119, 122-126 working in prototype | | | | | Completed | | | | | | | | | |
| TEMPTM5.ASM Coded with channel 60/64h access to A/D converter | | | Completed | | Used for Testing | | | | | | | | | |
| Rewrite TEMPTM5.ASM and TRANGE.INC for new channel A/D access for temperature sensor, review for Flash | | | | | | Started | | Informed Testers | | Completed | | | | |
| Trange.INC Recoded from TEMPTM5.ASM for new channel access, Ports 54 and 50h, review for Flash | | | | | | Started | Used for Testing | Informed Testers | | | Completed | | | |
| Tested Heat and Power Mangement on Pentium 90MHz CPU (75 MHz already tested on 9/15/1994) | | | | | | | | | Completed | | | | | |
| Trange.INC Recoded for BatteryPro Access via Flash Memory | | | | | | | | | | | Completed | | | |
| Started coding on Auto, On, and Off control by User Selection, ROM Based | | | | | | | | | | | | Started | Completed | |
| Auto, On, and / or Off allowed to be setup by User functional implementation ROM Based. | | | | | | | | | | | | | Completed | |
| ..Logic completed for Claims: | | | | | | | | | | | | | Completed | |
| ...Claim 19 | | | | | | | | | | | | | Completed | |
| ...Claim 20 | | | | | | | | | | | | | Completed | |
| ...Claim 107, 108, and 109 | | | | | | | | | | | | | | |
| Added Tables for Faster Processors as Intel introduced new products | | | | | | | | | | | | | | Completed |

EXHIBIT W